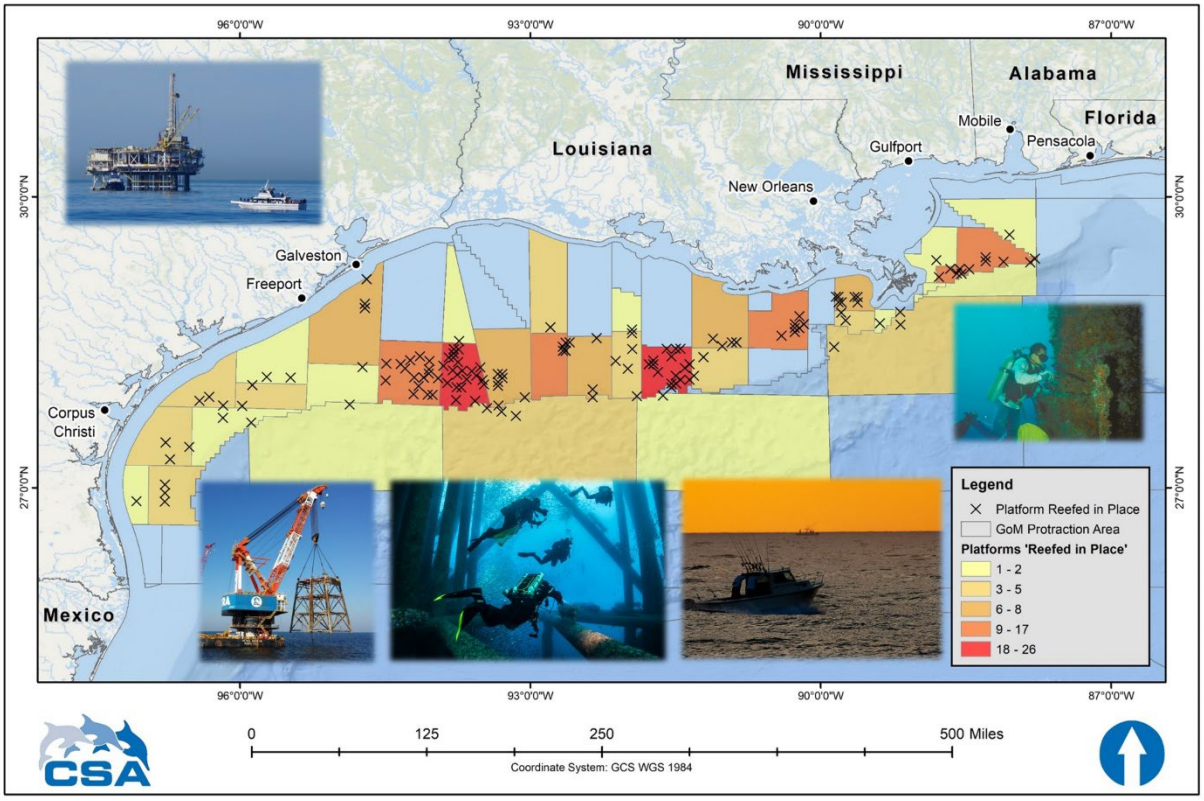
OCS Study
BOEM 2025-012

Understanding the Recreational Uses of Offshore Oil and Gas Platforms on the Outer Continental Shelf of the Gulf of America: Synthesis Report



U.S. Department of the Interior
Bureau of Ocean Energy Management
Sterling, VA

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

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March 2025

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U.S. Department of the Interior
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DISCLAIMER

Study concept, oversight, and funding were provided by the US Department of the Interior, Bureau of Ocean Energy Management (BOEM), Environmental Studies Program, Washington, DC, under Contract Number 140M0121P0005. This report has been technically reviewed by BOEM, and it has been approved for publication. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the US Government, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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CITATION

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List of Abbreviations and Acronyms

AIS	automatic identification system
APAIS	Access Point Angler Intercept Survey
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CEPRA	Coastal Erosion Planning & Response Act
CFR	Code of Federal Regulations
CHRGIS	Coastal Habitat Restoration Geographic Information System
CMP	Coastal Management Program
CSA	CSA Ocean Sciences Inc.
CSSC	Center for Sportfish Science and Conservation
CZMA	Coastal Zone Management Act
DVD	Dark Vessel Detection
EIS	environmental impact statement
FAD	fish aggregating device
FES	Fishing Effort Survey
FHS	For-hire Survey
GAMM	generalized additive mixed model
GIS	Geographic Information Systems
GLO	General Land Office
GOA	Gulf of America
GOM	Gulf of Mexico
GPS	global positioning system
HMS	highly migratory species
IMO	International Maritime Organization
IOT	Internet of Things
LADNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
MRFSS	Marine Recreational Fisheries Statistical Survey
MRIP	Marine Recreational Information Program
MVBS	mean volume backscatter
NAD	North American Datum
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
OCLC	Online Computer Library Center
OCM	Office of Coastal Management
OCS	Outer Continental Shelf
O/G	oil and gas
OID	Offshore Infrastructure Dashboard
SAR	Synthetic Aperture Radar
SOLAS	Safety of Life at Sea
TPWD	Texas Parks and Wildlife Department
TS	target strength
VMS	vessel monitoring system

1 Introduction

The Bureau of Ocean Energy Management (BOEM) oversees the development of the energy and mineral resources in U.S. Federal waters, which includes leasing policy and program development for offshore oil and gas platforms. These platforms are often used for recreational activities, including fishing and diving. This is particularly true in the Gulf of America (GOA) (formerly the Gulf of Mexico) due to its well-developed offshore oil and gas industry. BOEM recognizes that the existing literature does not adequately describe the extent to which recreational activities are dependent on offshore oil and gas platforms in the GOA. In addition, technological advances, socioeconomic changes, regulatory changes, and trends in platform installations and removals have likely influenced recreational practices since a prior BOEM study regarding this issue was conducted 20 years ago (Hiett and Milon 2002).

Since the early 1950s, recreational anglers and divers from coastal Louisiana have embraced the novel opportunities provided by the production platforms that emerged with the burgeoning offshore oil and gas operations in the northern GOA. In the relatively short course of about 40 years, much of the marine environment offshore Alabama, Mississippi, Louisiana, and Texas was transformed from level, sedimentary seafloor into a complex, hardbottom, albeit artificial, ecosystem. This emergence of structured habitat, where there once was none, promoted rapid expansion of new fisheries for the region, led most notably by the red snapper (*Lutjanus campechanus*) fishery; prior to the appearance of oil and gas platforms, red snapper was mostly caught east of the Mississippi Delta (Gallaway et al. 2009, Karnauskas et al. 2017; Stunz et al. 2021). Standing production platforms span the entire water column, attracting not only reef fishes (e.g., red snapper, sheepshead [*Archosargus probatocephalus*], and triggerfish [*Balistes capriscus*]) but also coastal pelagic species such as king and Spanish mackerels (*Scomberomorus cavalla* and *S. maculatus*), bluefish (*Pomatomus saltatrix*), blue runners (*Caranx crysos*), jack crevalle (*Caranx hippos*), amberjacks (*Seriola dumerili* and *S. rivoliana*), and cobia (*Rachycentron canadum*). This diversity of desirable species, coupled with ease of locating and re-locating the conspicuous surface expression of standing platforms, have provided offshore anglers and divers unique experiences during their trips to the open GOA.

Species composition, presence, and abundance of fishes and epibiota associated with offshore platforms have received considerable attention from researchers over the years (e.g., Gallaway and Lewbel 1982; Continental Shelf Associates, Inc. 1982; Stanley and Wilson 2000; Stanley and Wilson 1989; Boswell et al. 2010; Sammarco et al. 2014; Ajemian et al. 2015; Bolser et al. 2020). Although offshore oil and gas structures seem to attract as many anglers and divers as marine organisms, research on recreational use has been limited (e.g., Dugas et al. 1979; Ditton and Auyong 1984; Stanley and Wilson 1989; Hiett and Milon 2002). With removal of non-producing platforms outpacing installation of new structures, scientists and managers are faced with both ecological and socioeconomic challenges (Scarborough Bull and Love 2019; Kolian et al. 2017).

1.1 Study Objectives

This study focused on the following objectives:

- To better understand the overall magnitudes, geographic extents, and site-specific determinants (i.e., platform type, method of decommissioning, water depth) of recreational uses of offshore oil and gas platforms.
- To explore methods and viable opportunities to fill existing data gaps on the recreational use of offshore oil and gas platforms.

CSA Ocean Sciences Inc. (CSA) completed this study, following the objectives, to assess the recreational uses associated with oil and gas platforms in the GOA study area, which is defined as BOEM's Western and Central Planning Areas on the Outer Continental Shelf (OCS) (**Figure 1-1**). The Eastern Planning Area is not included because there are no oil and gas platforms. State waters are not within BOEM's jurisdiction; however, in this study, state agencies and their programs are discussed and assessed as sources of information, albeit only in some instances can the information or data be spatially discerned.

The magnitude, geographic extent, and site-specific determinants (i.e., platform type, method of decommissioning, water depth) of recreational activities near oil and gas platforms are influenced by various complex factors, including the following:

- Distance from port
- Distance from public beaches with boat launch facilities
- Presence of reefed structures
- Presence of targeted species
- Water depths
- History of fishing success at platform
- Dive site popularity
- Intensity of recreational use
- Type of platform
- Weather conditions
- Water temperature
- Water quality
- Localized currents

1.2 Study Tasks

This study was conducted to determine the extent to which existing information sources can inform BOEM's understanding of platform-based recreation. Over an approximate 24-month period, CSA conducted the following tasks, which are presented and summarized in this report:

- Reviewed the extant literature
- Reviewed and analyzed extant geospatial and agency data
- Conducted exploratory discussions with key persons (informants)
- Conducted analysis of approaches for future data gathering

1.3 Findings Summary

Findings from this study suggest that recreational fishing and diving regularly occur in the vicinity of offshore oil and gas platforms (both extant and decommissioned) in both the Central and Western Planning Areas. Platforms closer to shore are likely to be used more because they are more accessible, especially for individual users, and the nature of the platform structure (e.g., active, standing decommissioned, toppled-in-place, or reefed) and characteristics of its location (e.g., water depth, typical current patterns) also greatly influences desirability for recreation.

Early studies found that most users preferred to stay close to home and travel a minimum distance over water to reach platforms standing in water depths great enough (≥60 m) to harbor desired species. Recent data suggests the geographic patterns of recreational use of platform-based recreation still hold but other aspects of platform-associated, recreational fishing and diving have changed. Some obvious changes lie in

the reduced number of platforms due to decommissioning, changes in fishery regulations, and technological advances in vessel construction, horsepower, and fishing-finding capabilities.

The most noticeable change since the 1980s has been the removal of more than half of all the standing platforms. Decommissioning of platforms has reduced the number of platforms from over 4,000 in 1985 to 1,664 in 2022. Expected effects of this reduction include but are not to be limited to intensified recreational effort and crowding at certain platforms. Some portion of anglers and divers are now motivated to travel greater distances to avoid the crowds and experience better fishing or diving conditions.

A major concern among anglers and divers with decommissioning is the loss of the standing platforms. Toppled structures are acceptable to most anglers and divers, but conversations with key persons and other research indicated that many anglers and divers prefer standing platforms over toppled structures for several reasons, including improved fishing diversity and diving experience and ease of positioning.

The size, power, and fuel range of recreational vessels has increased markedly since the 1980s, expanding the area and water depths of the GOA accessible for recreation. Marine electronics for recreational anglers and divers have also advanced considerably over the years. New sonar technology allows recreational anglers to explore more widely and locate bottom fish in greater water depths and with greater precision than ever before.

In addition to vessel and electronic technological advances, changes in other fields could promote cheaper, faster, more efficient ways of gathering data focused on recreational platform use. Gathering spatially explicit information for any fishery can be a complicated and expensive challenge (e.g., Gardner et al. 2022). Potential methods reviewed in this report include remote sensing (satellite-based tracking of vessels), electronic reporting (smartphone applications), use of security cameras at boat ramps and marinas, satellite imagery, data mining of social media sites such as YouTube, and revised direct contact protocols.

Based on our findings, we ranked data collection methods in terms of their comprehensiveness and efficiency from most promising (1) to least promising (6):

1. Modify intercept surveys and household surveys from current National Oceanic and Atmospheric Administration (NOAA) Fisheries' Marine Recreational Information Program (MRIP)
2. Use electronic reporting by smartphone apps to record trips and track positions
3. Deploy cameras on a sample of platforms to obtain samples of use
4. Use aerial images taken at statistically designed sample of platforms
5. Sample security cameras at boat ramps and marinas
6. Data mine social media sites for fishing effort and locations

This report is organized to provide a synthesis of the methods (**Section 2**), key findings (**Section 3**), an analysis of approaches for future data gathering (**Section 4**), and a study summary for each of the sequentially completed tasks above (**Section 5**).

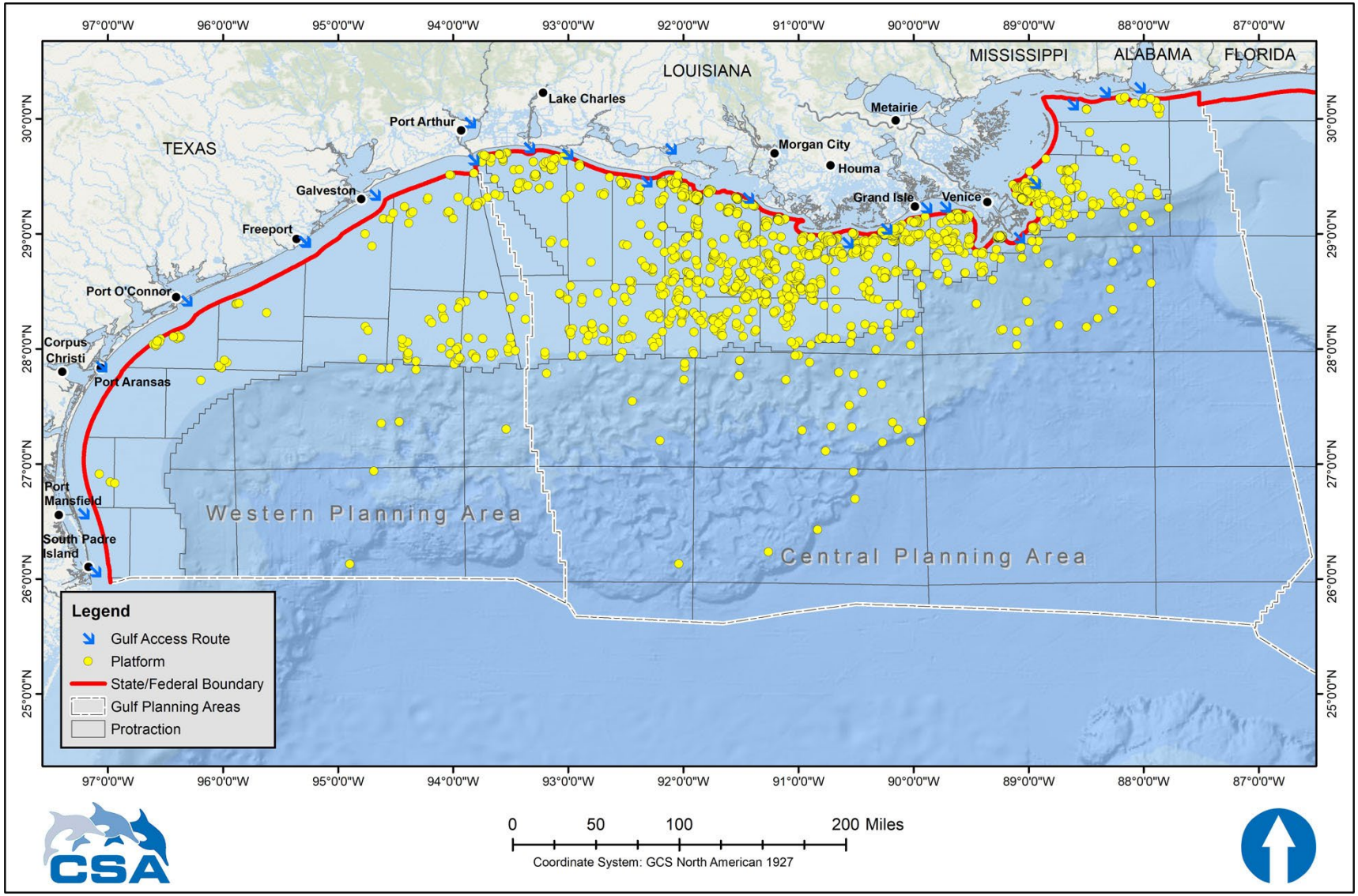

Figure 1-1. Study area
The Western and Central Planning Areas in the GOA showing existing platforms
Source: online Bureau of Safety and Environmental Enforcement (BSEE) Offshore Infrastructure Dashboard data (BSEE 2021)

2 Methods

This study performed four key tasks to help better understand the overall magnitude, geographic extents, and site-specific determinants (i.e., platform type, method of decommissioning, water depth) of recreational uses of offshore oil and gas platforms:

- Review the extant literature with particular emphasis on BOEM's Western and Central Planning Areas
- Analyze and review information obtained from the geospatial and agency data
- Conduct exploratory discussions with key persons (informants) in the region who have first-hand knowledge of recreational activities
- Assess existing recreational use data collection approaches and make recommendations for future approaches to fill existing data gaps

In this study, the three basic recreational user groups considered were recreational anglers, divers, and other.

Recreational anglers seek a variety of fish species for sporting challenge, relaxation, and personal consumption. Non-diving recreational angler gear is typically hook and line with rods and reels, including manually operated spinning or conventional open-faced reels and, to a lesser extent, electric-powered reels. The two main fishing methods are bottom fishing (anchoring or drifting, typically with dead or live bait) and trolling (surface or mid-water, with live, dead or artificial bait). Some recreational anglers fish from for-hire, charter boats and party boats, which also typically employ either bottom fishing or trolling.

Reference to "divers" includes both scuba divers breathing air, nitrox, or mixed gas, as well as free divers (breath-holding snorkelers). The actual numbers of these two subgroups are not clear, but spearfishing derbies have categories for both scuba and free divers (Hell Divers Spearfishing Club 2021). In addition to spearfishing, both groups may engage in non-consumptive activities such as photography, fish observing, marine life identification, or relaxation. For an entertaining historical account of spearfishing around Louisiana's offshore platforms, see Fontova (2003).

The "other" category is not well defined but may include cruising, sightseeing, marine wildlife/pelagic bird tours, sea kayaking, and paddleboarding. Information on oil and gas platform use in this category is very limited.

2.1 Literature Review

The literature review task focused on gathering existing information sources to inform BOEM's understanding of platform-based recreation within the GOA. The literature review considered peer-reviewed research; government-funded research and reports; Federal, state, and local planning documents; other literature types such as gray literature, books, and recreational guides; websites, state recreational fishery databases, and the MRIP database. Emergent information from this review was focused on the following:

- Location and magnitude of platform-based recreation
- Key site-specific determinants of platform-based recreation
- Recreational uses of converted platforms (i.e., Rigs-to-Reefs)
- Factors that could affect trends in platform-based recreation
- Other related issues (e.g., impacts of recreational activities)

2.1.1 Literature Search and Review Methods

Information related to recreational uses of offshore oil and gas infrastructure was gathered through a multi-step process for the geographic extent of BOEM's Western and Central Planning Areas of the GOA OCS (**Figure 1-1**). The five-step process below describes in general terms how we conducted the literature search and information gathering:

- Step 1: Conduct literature search on ProQuest Dialog, Online Computer Library Center (OCLC) WorldCat, internet search engines, and other digital sources.
- Step 2: Search CSA's existing digital library, which contains more than 60,000 references.
- Step 3: Title review: review document titles produced from the computerized literature search and request document abstracts as needed.
- Step 4: Abstract review: review document abstracts and request complete journal articles, reports, books, and/or conference proceedings as needed.
- Step 5: Complete document review: review full publications and prepare for text development.

After Step 4 was completed, we compiled the entries into a tabular format concurrent with Step 5. During Step 5, we evaluated the sources whether they provide information for the following categories: (1) background information; (2) geographic applicability; (3) magnitude of recreational platform use; (4) determinants of recreational platform use; (5) current recreational uses of artificial reefs and platforms; (6) trends in recreational platform use; (7) future impacts of decommissioned platforms used for recreational purposes; (8) geospatial information on recreational platform use; and (9) other relevant information. If a document was considered likely to inform the objectives by providing relevant information (e.g., types of recreation taking place, where it is taking place, why it is occurring, or recreation trends), these details were recorded (to the level of precision provided) in the Literature Review Spreadsheet provided as **Appendix A**.

A subjective relevance scoring matrix was used to evaluate if information sources were considered likely to inform the objectives of this project. The relative value of each information source in meeting the study objectives was scored, with determinations as being of No Value (score: 0), Low Value (score: 1), Moderate Value (score: 2), or Higher Value (score: 3) for each of the above categories. Though subjective, the purpose of the scoring matrix was to identify the applicability (or lack thereof) of each source towards meeting the project objectives, as well as to provide a means to efficiently reference information on each applicable topic (e.g., background information, site-specific determinants). This level of literature review was intended to be an initial effort in screening out less useful information and to focus on the most relevant information sources for subsequent tasks in this study (i.e., data analysis, exploratory discussions with key informants, and analysis of approach for future data gathering).

2.1.2 Literature Reviewed

We evaluated several different types of data sources for their utility in informing the literature review. Data sources compiled and evaluated include journal articles, reports, state recreational fishery databases, and NOAA Fisheries' MRIP. We conducted internet searches to locate potentially relevant websites and the digital document repositories, the latter of which served as sources of gray literature and conference papers, including web-wide keyword searches and maintained sites. Examples are listed below.

- Aquatic Commons – http://aquacomm.fcla.edu/
- OceanDocs – http://www.oceandocs.net/
- OnePetro – https://www.onepetro.org/
- Osti.gov – https://www.osti.gov

We identified relevant source material pertaining to recreational uses based on a search of numerous bibliographic and library sources. An extensive search for all relevant scientific and technical information utilized the following four major sources:

- ProQuest Dialog (https://dialog.proquest.com/professional/commandline)
- Online Computer Library Center (OCLC) WorldCat (http://www.oclc.org/us/en/worldcat/default.htm)
- Internet search engines to locate relevant websites such as conference proceedings and archives (e.g., https://www.google.com; https://www.bing.com; https://search.yahoo.com)
- Digital Repositories, including industry-related sites and web-wide open term searches

For each planning area, we researched agency management of platform-based recreation opportunities, settings, experiences, trends, and other related uses as listed below. We reviewed regulatory guidance, policy, and planning documents, as well as recreation literature, materials, guidebooks, and internet/social media content. These sources established a baseline of information to consider for future assessments of specific recreation activities and their relevance to inform the study objectives. Recreation management categories and their definitions included the following:

- Recreation Opportunity: Magnitude of platform-based recreation
- Recreation Setting: Site-specific determinants of platform-based recreation
- Recreation Experiences: Recreational uses of artificial reefs
- Recreation Trends: Factors affecting trends in platform-based recreation (e.g., decommissioning)
- Other related issues (e.g., seasonality, weather, boating/shipping lanes)

2.1.2.1 Peer-reviewed Journals and Reports

The primary sources of information for peer-reviewed journals and reports were ProQuest Dialog and OCLC WorldCat. ProQuest Dialog is a unique aggregation of the world's leading bibliographic and full text sources and offers the largest collection of authoritative content that can be searched at one time. Each database in ProQuest Dialog databank covers the scientific and technical literature published for at least the past 40 years, with some covering more than 100 years. Proquest Dialog allows the user to download complete citations and abstracts that can be imported into multiple bibliographic management software programs and handles the copyright fees for use of this bibliographic information.

OCLC WorldCat is a non-profit, member-driven library community that can assist with locating relevant books, proceedings, technical reports, and gray literature. WorldCat is a cooperative database of 452 million bibliographic records contributed by more than 72,000 libraries in 170 countries, making it the world's largest, most complete, and most consulted library union catalog of electronic, print, and digital resources. Items found in WorldCat may be purchased or borrowed via the OCLC Interlibrary Loan System.

WorldCat includes the library holdings of the many government organizations whose materials are typically essential to environmental projects, such as NOAA Fisheries, U.S. Geological Survey, U.S. Fish and Wildlife Service, and the U.S. Navy. Public and private marine and oceanographic research institutions also contribute bibliographic holdings to the WorldCat database, giving access to the extensive libraries of Woods Hole Oceanographic Institution, Virginia Institute of Marine Science, Rosenstiel School of Marine and Atmospheric Sciences, Mote Marine Laboratory, Harbor Branch Oceanographic Institution, Skidaway Institute of Oceanography, and many others. We searched the individual websites of these academic/research institutions and government agencies for relevant information.

2.1.2.2 Gray Literature

We searched key authoritative Federal resource and geospatial data sources for relevant recreational use information including the BSEE Data Center, Marine Cadastre, NOAA Fisheries, NOAA Fisheries' MRIP recreational fishing database, and NOAA Fisheries Southeast region data. Key authoritative state-level resource and geospatial data sources included the Texas Parks and Wildlife Department (TPWD) and the Louisiana Department of Wildlife and Fisheries (LDWF).

2.1.2.3 Representative Website Information

Online resources contained information and data for GOA recreational fishermen including specific numbers of fishing trips, efforts per fishing trip, catch species, and catch species landing estimates. Many of these information sources are provided by surveys conducted by individual state wildlife and fisheries agencies, non-profit recreational fishing organizations, and recreational fishing activities such as fishing tournaments and rodeos. These sources provide information on recreational uses in both state waters and on the OCS. One of the more popular and important GOA recreational target species fished for on artificial reefs and structures is the red snapper. Several of the recreational fishing surveys were focused on collecting information on red snapper exclusively, due to the popularity of the fish and recent sustainable fisheries management practices put into place in the GOA. Much of the red snapper recreational fishing information collected by States is certified under the MRIP.

The following is a summary of the state-specific online resources identified as providing potentially useful information for evaluating the use of offshore oil and gas structures in the GOA by recreational fishermen, including those that extend into the OCS. State departments of wildlife and fisheries along the northwestern GOA have historically collected recreational fishing data to assist them in tracking the activity and managing the resources for sustained uses. Additionally, organizations like the Gulf States Marine Fisheries Commission compile recreational and commercial fisheries catch information for all Gulf Coast states.

Alabama, Mississippi, Louisiana, and Texas collect annual data on recreationally caught red snapper in each of their respective states and associated Federal waters through various fishing survey programs. Examples include Tails n' Scales and iSnapper, which collect trip and catch information provided by recreational angler surveys through online and cellphone submittals. Red snapper data include month, mode, region, and species estimates on the number of fish caught, total weight, number of trips, catch and effort estimates, and catch types (e.g., kept, released alive, discarded dead). Most red snapper recreational fishing in the northwest GOA occurs on artificial structures such as oil and gas structures and artificial reefs, as they provide the bulk of red snapper fishable habitat in that region of the GOA. Recreational fishing data from these programs do not include spatial information to inform where the fish were caught.

Recreation activities in Alabama are overseen by Alabama Coastal Management Program and the Alabama Department of Conservation and Natural Resources. Recreation activities at oil platforms may originate from Mobile or Gulf Shores, Alabama.

The Mississippi Department of Marine Services, Coast Resources manages recreational resources. Recreation activities at oil platforms may originate from Bay St. Louis, Long Beach, Gulfport, Mississippi City, Biloxi, or Pascagoula, Mississippi.

Louisiana's LA Creel program collects recreational and for-hire charter data, which include multiple species catch data (e.g., number of fish caught per trip, number of trips) but not spatial data. The Louisiana Office of Coastal Management regulates development activities and manages the resources of the coastal zone, especially those having a direct and significant impact on coastal waters; this office also maintains, protects, develops, and restores or enhances the invaluable coastal region of the State of

Louisiana. Recreation activities at oil platforms may originate from Holly Beach, Cameron, or the Delta area of Louisiana.

The TPWD maintains a database containing the locations of artificial reefs and has historically been collecting recreational fishermen data. Access to their data is by submitting an Open Records request online or by mail. Recreation along the Texas coast extends from the U.S.-Mexico international border at Boca Chica Beach to Port Arthur on the Louisiana border. Recreation activities at oil platforms may originate from South Padre, Corpus Christi, Port Aransas, Surfside Beach, Jamaica Beach, Galveston, Port Isabel, Sabine Pass, or Crystal Beach, TX.

2.1.2.4 Other Relevant Sources

We also queried other sources of relevant information. Organizations such as the Center for Sportfish Science and Conservation and local sport fishing organizations collect local and regional recreational fishing information through ongoing studies and surveys. One organization, EcoRigs, focuses on saving retired platforms for beneficial environmental habitat and fisheries resources; EcoRigs information post-2012 could not be located.

2.2 Geospatial and Agency Data Review

The data sources used in the review of recreational uses of offshore oil and gas platforms in the GOA included geospatial data sources, and data obtained from Federal and state agencies. We assessed the extent to which existing data sources could provide insights regarding the overall magnitudes, geographic extents, and site-specific determinants of recreational uses of offshore oil and gas platforms by mapping the data obtained to look for relative abundance, location, spatial trends, factors that could affect trends, and identification of recreational use (**Section 3.2**).

2.2.1 Geospatial Data Sources Used in the Analysis

To examine the distribution of existing platforms and reefed-in-place structures in the study area, we used the following geospatial data sources:

- BSEE Offshore Infrastructure Dashboard (OID)
- Associated OCS Facility Infrastructure map interface (ArcGIS Online)
- BSEE Data Center to access information, conduct online queries of platform structures, and download data relevant to the analysis
- State Rigs-to-Reefs programs
- BSEE Technical Data Management Section (contacted by CSA analysts)

Figure 2-1 shows the protraction area identifiers for geographic reference to subsequent figures. BOEM developed the protraction boundaries to delimit areas available for potential offshore mineral leases, determine the state/Federal offshore boundaries, and determine the limits of revenue sharing and other boundaries to be considered for leasing offshore waters. Based on the data provided in the BSEE Data Center, as of April 1, 2021, there are currently 1,756 oil and gas platforms on the GOA OCS, with the majority located in the Central Planning Area.

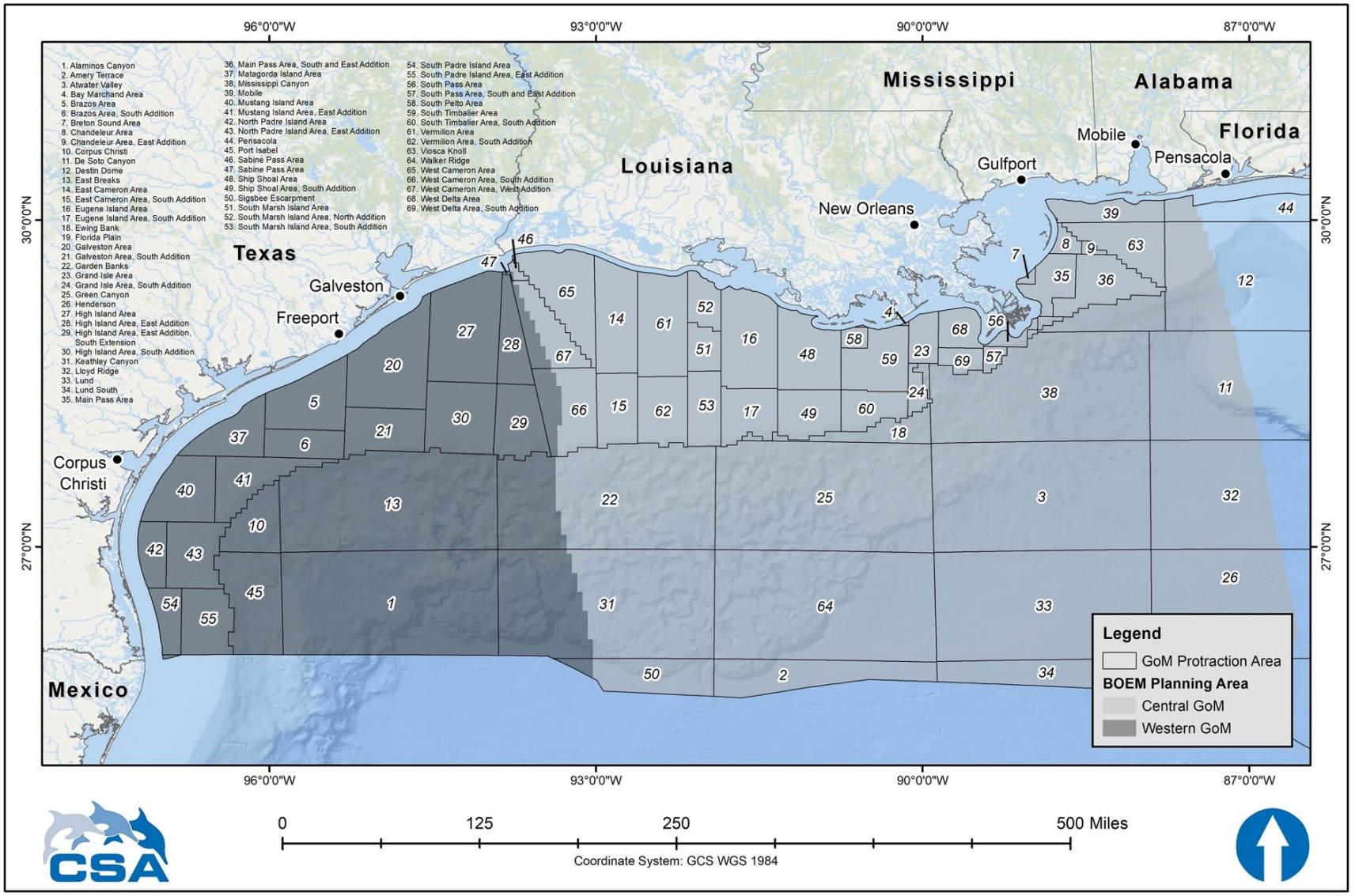

Figure 2-1. Protraction Areas within the Western and Central Planning Areas
Source: online BSEE OID data (BSEE 2021)

2.2.1.1 BSEE Geospatial Data

Coordinating with the BSEE Technical Data Management Section in May 2021, CSA analysts received an authoritative data file in Excel format that provided the "Disposition of Oil and Gas Structures in Federal Waters," which summarized the platforms in Federal waters decommissioned by year, along with a list of "reefed" structures. Of the 558 reefed structures, 191 were described as "toppled" or "partially removed," which were then classified by CSA analysts as "reefed-in-place" for this analysis.

To develop maps illustrating the locations of existing platforms and structures reefed-in-place, we assumed the data in Excel files and reviewed, formatted, and post-processed the data using Esri ArcGIS Geographic Information Systems (GIS) software. Thus, we integrated the information in a geospatial context, linking the latitude and longitude locations to protraction areas and blocks to examine spatial distribution in both existing platforms and reefed-in-place structures. In some cases, due to data gaps in the BSEE data, we consulted the OCS Operations Field Directory Quarterly Report for the GOM [Gulf of Mexico] Region (BOEM 2021) to manually fill in missing information. The derived geospatial data products include a comprehensive geodatabase with metadata conforming to the Content Standards for Digital Geospatial Metadata (ISO 19115-1).

2.2.1.2 State Geospatial Data Provided by Rigs-to-Reefs Programs

We retrieved geospatial data from Texas, Louisiana, Mississippi, and Alabama GIS databases in May 2021. Geospatial data sources included those available from state Rigs-to-Reefs programs (Texas, Louisiana, Mississippi, Alabama).[1] We identified other state geospatial data sources, but they provided only onshore data. For example, the Texas General Land Office's (GLO) Coastal Management Program website (Texas GLO 2021) provided key information to inform the coastal communities and associated ports that were considered in this study. In addition, parks, beaches, and natural coastal areas were referenced from the Texas GLO website. Similarly, the Louisiana Department of Natural Resources (LADNR) Office of Coastal Management (OCM) applies only to state waters, within the Coastal Zone Boundary (LADNR 2021).

The Texas Rigs-to-Reefs program is administered by the TPWD and operated in accordance with the Texas Artificial Reef Fishery Management Plan (Stephan et al. 1990). Texas Rigs-to-Reefs geospatial data and associated attributes were retrieved from TPWD. Geospatial attribute data included reef site ID, North American Datum (NAD) coordinates, nearest port, distance offshore, water depth, square footage, acres, and date decommissioned.

The Louisiana Rigs-to-Reefs program is administered by LDWF, Artificial Reef Program in accordance with the Louisiana Artificial Reef Plan (Wilson et al. 1987). Louisiana Rigs-to-Reefs geospatial data and associated attributes were retrieved from LDWF. Geospatial attribute data included reef site name, distance offshore/nearest port, water depth, donor, structure, latitude, and longitude.

The Mississippi Rigs-to-Reefs program is administered by the Mississippi Department of Marine Resources, Artificial Reef Program in accordance with Mississippi's Artificial Reef Development Plan (Mississippi Department of Marine Resources 1999). Geospatial data and associated attributes were available only for state waters. No geospatial data were available within the study area (Federal waters).

[1] The Rigs-to-Reefs program was established under the National Fishing Enhancement Act of 1984, which recognizes the social and economic values in developing artificial reefs, establishes national standards for artificial reef development, provides for creation of a National Artificial Reef Plan, and provides for establishment of a reef-permitting system (BSEE 2021).

The Alabama Rigs-to-Reefs program is administered by the Alabama Department of Conservation and Natural Resources, Marine Resources Division in accordance with Alabama's Artificial Reef Program (Outdoor Alabama 2021). Geospatial data and associated attributes were available only for state waters. No geospatial data were available within the study area (Federal waters).

2.2.2 Recreational Use Data Obtained from Federal and State Agencies

In addition to the geospatial data and information extracted from the literature review, recreation data from Federal and state agencies was also obtained to help provide data on recreational use of oil and gas platforms. This section provides a synopsis of the data obtained from the following sources:

- MRIP
- LA Creel
- Tails n' Scales (Mississippi) and Snapper Check (Alabama)
- iSnapper
- Rigs-to-Reefs programs in the GOA

2.2.2.1 NOAA MRIP

The MRIP collects information on recreational catch and effort around the United States. The MRIP is administered through a state-regional-Federal partnership; NOAA Fisheries maintains a central role in developing recreational catch and effort survey standards, administers fisheries surveys, and produces recreational catch estimates. These catch estimates are available in a publicly available database, which can be queried using a variety of input parameters. Note that in 2008 the MRIP was established and replaces its predecessor, the Marine Recreational Fisheries Statistical Survey (MRFSS), which had been in place since 1976.

The MRIP conducts broad household surveys known as Fishing Effort Survey (FES). This is a mail survey distributed to a representative sample of residential households in coastal states, regardless of whether someone in the household has fished. The resulting data are used to estimate private angler efforts from shore and private boats. This survey focuses on recreational fishing activity; it does not currently include questions about diving-associated fishing but could be modified to encompass diving activities. State agencies also conduct a For-Hire Survey (FHS) via telephone with state and federally permitted for-hire vessel representatives (e.g., charter and party boats). Although NOAA Fisheries administers the FHS, only state agencies conduct the FHS.

The in-person intercept survey of MRIP is now called Access Point Angler Intercept Survey (APAIS) and is conducted with recreational anglers at public fishing access sites. The resulting data are used to estimate private angler and for-hire catch, and to account for fishing efforts from private anglers, charter boats, and headboats.

The NOAA Fisheries' MRIP database includes estimates of recreational catch and effort from charter and private/rental vessel for the GOA from Florida, Alabama, and Mississippi. In Texas, TPWD monitors marine recreational fishing. Recreational catch and effort data are not readily available from the TPWD. MRIP estimates for Louisiana are not available after 2013 and are instead accessible through the LDWF, LA Creel program. The MRIP database is one of the few that have assembled spatial catch data and that are partitionable into federal versus state waters.

Although the MRIP dataset presently does not include explicit information regarding platform use by recreational anglers, we examined the trends in numbers of trips made by fishing mode (private and charter boats) to fishing areas (inshore, ≤5.6 km [≤3 nautical miles (nmi)] from shore, >5.6 km [>3 nmi] from shore) of Alabama, Louisiana, and Mississippi from 2000 to 2021. Note that Louisiana data were

available only from 2000 to 2013 in MRIP. Data were obtained from the MRIP website (personal communication from the NOAA Fisheries, Fisheries Statistics Division, June 2022). To supplement Louisiana data for the years 2014 to 2021, a similar data query was executed from the LA Creel survey (personal communication from the LDWF, June 2022) (**Section 2.2.2.2.1**). No data were available from Texas.

We plotted these data for each combination of state, fishing mode, and fishing area over time as stacked bar graphs to show the proportion of trips made to different areas. Recreational trips made only to offshore waters (>5.6 km [>3 nmi]) from shore were assessed using simple linear regression to document any trends in the time series data. We conducted the plotting and regression analyses using the R-computing platform (R Core Team 2020) (**Section 3.2.2**).

Federally permitted for-hire vessels are now required to submit electronic information on catch and effort. Operators enter data electronically using specialized software available for mobile phones, tablets, and computers. Data entries for these submissions include trip start and end dates, trip start and end times, end port, vessel and captain identification, number of anglers, number of crew, method of fishing, hours fished, primary depth fished, species kept, species discarded, charter fee, fuel used, and fuel price per gallon. There are data entries regarding fishing locations, but this has recently changed (13 December 2021; 85 *FR* 44005). NOAA Fisheries is now requiring Vessel Monitoring System (VMS) units on for-hire vessels with Gulf reef-fish, charter, and party permits. A VMS unit can be a cellular-based device (capable of storing locations when out of cellular range and transmitting when in range) or a satellite-based, real-time VMS unit.

2.2.2.2 State Recreational Fishing Data

The following is a summary of the state-specific online resources identified as providing potentially useful information for evaluating the use of offshore oil and gas structures in the GOA by recreational fishermen. Some level of spatial information can be extracted, but data specific to platform use is not usually discernable. State wildlife and fisheries departments along the northwestern GOA have historically collected recreational fishing data to assist in tracking activity and managing resources for sustained uses. Additionally, organizations like the Gulf States Marine Fisheries Commission compile recreational and commercial fisheries catch information for all Gulf Coast states.

2.2.2.2.1 LA Creel (Louisiana)

Louisiana's LA Creel program collects recreational and for-hire charter data, including multiple species catch data (e.g., number of fish caught per trip, number of trips) but not spatial data; the lack of spatial data limits the ability to specifically assign catch to offshore platforms. The LDWF LA Creel program was designed in 2013 as a red snapper landings survey and expanded in 2014 to all saltwater recreational species at marinas and boat launches throughout Louisiana, replacing NOAA MRIP. In January 2018, NOAA Fisheries certified LA Creel as an alternative to the MRIP APAIS and FES.

The LA Creel survey consists of in-person biologist interviews with private anglers at public fishing access sites along the GOA, as well as weekly telephone and email surveys of licensed anglers and charter boat captains on the previous week's fishing activities. Holders of Recreational Offshore Landing Permits are sampled at higher rates during red snapper season. Data collected includes fishing location, length of trip, species of fish harvested and thrown back, fish weights, and lengths. The resulting data are used to estimate private angler and charter boat catch and catch effort; this statistically significant recreational fishery information aids in managing Louisiana's fishery resources. By using in-person interviews, LA Creel minimizes the burden of recreational data collection on anglers and captains, maximizes the efficiency of recreational surveys, and provides precise, near-real-time harvest estimates. The LA Creel data query tool (Louisiana Department of Wildlife & Fisheries 2021) allows users to search for

harvest/catch and effort data. The query filters data by year, month, basin, species, and activity type. Query results are in table format and can be downloaded as a .csv file.

2.2.2.2.2 Tails n' Scales (Mississippi) and Snapper Check (Alabama)

Red snapper landings in Mississippi and Alabama are monitored by use of mandatory smartphone applications (Tails n' Scales and Snapper Check, respectively). Both surveys use a capture-recapture survey design (i.e., initial application-based reporting and subsequent dockside sampling), and both surveys have been certified by NOAA MRIP. The data collected from these surveys supplement the general MRIP surveys in each state but do not contain spatial data, limiting the ability to specifically assign catch to offshore platforms.

2.2.2.2.3 Texas Parks and Wildlife Survey

The Texas Coastal Creel Survey consists of voluntary, in-person interviews with private anglers at boat access sites in Texas. A typical trip-ending coastal creel interview includes questions relating to the fishing trip plus and the interviewer examining and counting the catch as quickly as is practical. Six randomly selected fish of each species are measured for total length to the nearest millimeter. The resulting data are used to estimate private angler catch and effort.

2.2.2.2.4 iSnapper

The MRIP program evaluated the integrity and potential for bias of a standalone smartphone application, iSnapper, for collecting recreational fishing data that could be used to supplement current survey efforts (MRIP 2019). It was concluded that reporting of recreational information via an application or website without subsequent follow-up with dockside sampling, while having the potential to produce timely information, lacks the requirements inherent in robust fisheries survey design (e.g., consideration of the goals of the program, use of the data, primary and secondary data elements, target population, response rates, reporting accuracy).

We contacted the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi, which maintains the iSnapper data. They organization indicated that the general results of the project are available, but, due to the participants concern regarding their fishing location confidentiality, they do not release the actual fishing locations collected as part of the iSnapper program. This confidentiality severely limits the utility of these data to inform platform use.

2.2.2.3 GOA Rigs-to-Reefs Programs

As part of the agency data review, we contacted each of the Gulf state Rigs-to-Reefs coordinators in May 2021 to ascertain what, if any, GIS data was available related to recreational uses under the Rigs to-Reefs Programs. Further outreach in June 2021 included compiling anecdotal and professional knowledge of recreational use; however, no agency studies on recreation associated with the Rigs-to-Reefs program have been initiated. Rigs-to-Reefs coordinators contacted included the following programs and individuals:

- Texas: Brooke Shipley
- Louisiana: Mike McDonough
- Mississippi: Travis Williams
- Alabama: Craig Newton

2.2.2.3.1 Texas

Based on discussion with Mr. Shipley, data on recreation uses other than fishing are limited and only associated with diving destinations on the southern portions of state waters near Padre Island, or many miles offshore at platforms or the Flower Garden Banks. The Mississippi River plume and shallow waters of the continental shelf preclude optimal diving conditions and are not measurably utilized by divers. Specific reefed-in-place platforms were topped at depths designed for free-diving and spearfishing (13.7 to 19.8 m [45 to 65 ft] below surface). No location-specific geospatial data exists for non-fishing recreation, but diving and spearfishing were reported to be popular activities at artificial reefs with platforms.

2.2.2.3.2 Louisiana, Mississippi, and Alabama

Based on general discussions with other state Rigs-to-Reefs coordinators Mr. McDonough (Louisiana), Mr. Williams (Mississippi) and Mr. Newton (Alabama) no additional information apart from the available geospatial data of Rigs-to-Reefs. Known recreational pursuits include fishing, diving, free-diving, and spearfishing.

2.2.2.4 Other Relevant Sources of Fisheries Data

Other sources of information queried included the Center for Sportfish Science and Conservation (CSSC), dedicated to providing key science-based information that supports sustainable management of the multibillion-dollar recreational fishery that flourishes along the Gulf Coast. The CSSC, working with partners like universities, research institutes, and local sport fishing organizations, collects local and regional recreational fishing information through ongoing studies and surveys. The Center maintains a web page dedicated to providing publications about sportfishing science and conservation. All publications are peer-reviewed scientific journal entries and are provided in digital downloadable format. The CSSC is located at the Hare Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi. A query of CSSC's publications did produce three platform-related or offshore oil and gas infrastructure fisheries publications; these studies are generally focused on fishery habitat and population science at platforms, with little information on the recreational uses of the offshore oil and gas infrastructure.

One organization, EcoRigs, focuses on saving decommissioned platforms for beneficial environmental habitat and fisheries resources. Like CSSC, EcoRigs provides scientific research, legislative lobbying, easement purchasing, financing, and biological assessments for reef habitat and fishery populations. Most EcoRigs studies have focused on protection and conservation of ornamental fish and invertebrates and not on recreational use. One of the studies (Kolian et al. 2018) highlights recommendations to amend existing laws to improve the likelihood that retired platforms are used to culture fish and invertebrates. The study does point out the value of artificial reefs for recreational purposes but does not provide geospatially explicit information on recreational fishing use. EcoRigs have successfully studied over 150 fixed platforms in the GOA. EcoRigs is currently working with an oil developer to utilize 11 platforms (not topped) to sustainably harvest ornamental marine life.

2.3 Exploratory Discussions with Key Informants

We conducted exploratory discussions with key informants who have experience and first-hand knowledge of recreational activities associated with offshore oil and gas platforms in the region to help fill data gaps. This process focused on collecting qualitative information pertaining to the importance of platforms to recreational fishers, divers, and other recreational users; factors that drive platform selection; and the magnitude of platform use for different recreational activities. The exploratory discussions were intended to supplement the information available from existing literature and data by speaking directly with individuals who have knowledge of the magnitude, geographic patterns, and general nature of platform-based recreation in the GOA.

2.3.1 Summary of Approach to Exploratory Discussions

We conducted exploratory discussions with key informants to garner a general understanding of their interests on the topic and to understand any information that may assist our query (directly or indirectly, e.g., use of platforms, other sources of information). We used two formats, small group discussions and one-on-one (or individual) discussions. The one-on-one format was used for initial discussions and for follow-up discussions.

- **Small Group Discussions ─** Semi-structured discussions focused on a unique set of topics, each meeting including fewer than 10 members of the public.
- **Follow-up Conversations ─** Calls or emails to key informants to clarify or augment information provided via direct information requests or small group discussions.

The process of identifying discussion participants was based on a recreational user assessment using publicly available information and our own knowledge of regional recreational settings to generate a list of potential key informants from a wide range of groups: state agencies, artificial reef coordinators, recreational fishing charter captains, recreational fishing organizations, diving clubs, birding groups, conservation organizations, and others with experiential knowledge of platform-based recreation.

To select key informants for inclusion in exploratory discussions, the first step was to eliminate those from the preliminary list who are not active in the study area (e.g., entities in Florida), any outdated contacts, and any individuals that were previously contacted as part of the geospatial data analysis. Then the individuals were evaluated to determine whether they met one or more of the following criteria:

- Has data or information needed (has needed data)
- Is a state or regional representative within their organization (state/regional point person)
- Is active and well connected within their recreational use community (recreational use point person)
- Represents a sub-type of recreational use, geography, or other perspective not otherwise represented (unique perspective)
- Was identified independently by both SWCA and CSA (in common)

Those who met the first criterion (has needed data) were selected for direct information requests. Those who met one or more of the other criteria were selected to participate in small group discussions with others representing the same recreational use type.

During implementation, three modifications were made to the proposed approach to encourage participation by key informants. The first was to shift the timing of issuing invitations and to conduct exploratory discussions approximately one month later to avoid contacting key informants while they were still dealing with immediate effects of Hurricane Ida in August 2021.

The second modification was to issue additional invitations to individuals recommended by invitees on the initial invitation list, up to a maximum of 10 total invitees per small group discussion. The addition of informants identified via referral (aka 'chain' referral or 'snowball' sampling) is a type of purposeful sampling used to identify people with knowledge on a particular topic by asking others in their community to identify those with knowledge on the topic of study. This approach resulted in participation by several individuals with useful information to share who had not been found through our original identification process.

The third modification to the proposed approach was to hold individual sessions with charter fishing captains to cover the content of a small group discussion in the format of a follow-up conversation. Informants indicated they had very limited availability because they were away leading fishing trips during October. We were unable to identify a time when multiple informants could all join a small group discussion at the same time, so we spoke individually with those who were available to accommodate their schedules.

The following types of platforms and man-made structures were considered as part of these exploratory discussions. All "platforms" are understood to be oil and gas platforms.

- **Active platforms** – Some or all platforms would be what one informant referred to as "manned," meaning they have people working on them.
- **Standing decommissioned platforms** – These decommissioned platforms have been left in place and retain habitat throughout the water column.
- **Platforms decommissioned and reefed-in-place** – These platforms structures may be
  - partially removed, meaning the structure is cut off at some height below the water surface
  - toppled-in-place, meaning the cut platform is laid out horizontally on the ocean floor near the location of the original platform
- **Reefed-off-site** – These platforms have been towed and placed in an existing reef site or reef planning areas in another location, either alone or in combination with other materials (e.g., ships, road debris, etc.), and used to create an artificial reef. Many of these are created and maintained by state Rigs-to-Reefs programs.

2.3.1.1 Small Group Discussions and Follow-Up Conversations

One small group discussion was held with each of three groups of key informants with knowledge of diving, pelagic birding, and recreational fishing. Small group discussion participants received an invitation to participate via email. Participants were all asked to review and sign a participant consent form (i.e., acknowledging their informed consent) prior to the discussions. Small group discussions each lasted one hour and included a brief overview of the study followed by facilitated discussion of questions tailored to each recreation type (**Table 2-1**).

Charter fishing key informants had very limited availability to participate because October is a busy season for charter fishing and some operators, particularly in Louisiana, were still recovering from Hurricane Ida (August 2021). Rather than a small group discussion, individual follow-up conversations were held with two individuals with knowledge of charter fishing in the Gulf. We also received input via email from one other charter fishing captain who was unable to participate in a call. The follow-up conversations that focused on charter fishing lasted up to 30 minutes and included a brief overview of the study and discussion of the information sought related to charter fishing (**Table 2-1**).

Table 2-1. Information sought in small group discussions

Recreational Use Type	Information Sought
Charter Fishing	• Relative value of topped and above-water platforms for charter fishing • Sources of information used to identify charter fishing routes and destinations • Factors other than fishing prospects influencing the choice of route or destination • Locations of platforms utilized
Diving (including free-diving and spearfishing)	• Timing of the high season for diving • Minimum and maximum water depths for diving • Preferred platform features for diving • Shared repositories of favored dive site locations
Pelagic Birding	• Oceanographic features birders target to determine routes and birding destinations • Typical birding behavior around platforms • Associated recreational activities, such as fishing or diving, that may occur alongside birding • Prey fish species for birds of interest to birders
Recreational Fishing	• Water depth limitations for recreational fishing • Depth and site preferences for rod and reel vs. spearfishing • Management considerations states face when dealing with different types of platforms • Reasons behind pattern of all Mississippi and Alabama platforms being in state waters • Influence of state vs. federal fishing regulations on recreational fishing site choices

3 Key Findings

3.1 Findings from Literature Review

Key findings of the literature review are summarized in the following sections based on the overall objectives of the study as well as by recreational use. A complete list of literature reviewed during this task is provided in **Appendix A**. The literature review identified approximately 135 entries with potential to positively inform our understanding of existing recreational uses of offshore oil and gas infrastructure within the study area.

Since the first published reports of recreational use of platforms by charter boat operators (e.g., Dugas et al. 1979; Hardison 1982), few studies dedicated to characterizing recreational use have been undertaken. The relevant studies obtained through the literature search were focused on fishing and diving and may be divided into two groups based on methodology. The first group included two studies which incorporated the NOAA Fisheries' MRFSS (now MRIP) (Witzig 1986; Hiett and Milon 2002). The MRFSS was designed to obtain representative samples of recreational fishing effort and catch by residents of coastal states. The second group of studies targeted small, opportunistic samples of recreational anglers, divers, or platforms off Louisiana and Texas (Ditton and Auyong 1984; Auyong et al. 1985, Stanley and Wilson 1989; Gordon 1993; Schuett et al. 2016; Schuett et al. 2015).

In 1982, the Minerals Management Service (now BOEM) entered a formal agreement with NOAA Fisheries to modify MRFSS questions to ask anglers if their trip included visits to oil and gas platforms (Scogin 1982). Scogin (1982) explained how NOAA Fisheries added a question to both telephone and intercept surveys asking anglers (or divers) if their trip included being within 200 ft of an oil and gas platform. This data, collected from January 1984 to December 1984, was reported for Louisiana and Texas by Witzig (1986).

Almost 20 years later, Hiett and Milon (2002) used MRFSS effort estimates to determine recreational use (demand) as a starting point for an analysis of economic impacts of recreational angler and diver use of offshore platforms. For one year (1999), they conducted an independent intercept survey to estimate use of offshore platforms by recreational users for the coastal states (Alabama, Mississippi, Louisiana, and Texas). Surveyors asked boaters (anglers, divers, or other), among other questions, if any part of their trip was within 300 ft of an oil and gas production platform.

One of the first studies designed and executed to describe use of oil and gas platforms by recreational anglers and divers was by Ditton and Auyong (1984), also summarized by Auyong et al. (1985). These researchers used daily sightings of recreational vessels by untrained platform workers from a sample of 164 offshore platforms distributed off the Louisiana coastline over a year (April 1980 to March 1981). This study was based on opportunistic or convenience sampling, and was not a statistically based design like MRFSS; however, it was considered representative of spatial use by recreational anglers and divers (Ditton and Auyong 1984).

In Ditton and Auyong (1984), the 164 sample platforms were distributed in three broad regions from east to west: Delta, Bay, and Cameron (**Figure 3-1**). The regions differed by shelf characteristics (shelf width and water depth gradient), distance from shore to platforms, probable fishing destinations (river delta, bay, or offshore), proximity to population centers, and availability of access points (quality of transportation links and location of marinas, charter boats, and launch sites).

The Delta region extended from the Mississippi state line to Grand Isle along the Louisiana shoreline, and included Lease Blocks South Pelto, South Timbalier, Grand Isle, West Delta, South Pass, Main Pass, and Breton Sound. Key ports in the region were Grand Isle, Venice, Port Fourchon, Cocodrie, Empire, Port Eads, and Hopedale. The Bay region extended westward from the western edge of the Delta region to Cameron including Lease Blocks Ship Shoal, Eugene Island, South Marsh Island, and Vermilion. The key ports in this region were Freshwater Bayou, Mermentau River, and Cypremort. The Cameron region extended from Cameron to Sabine Pass and was composed of East Cameron and West Cameron lease block areas. Cameron and Grand Chenier were the key ports in this region (**Figure 3-1**).

Stanley and Wilson (1989) sampled anglers and divers utilizing platforms offshore Louisiana from 1986 to 1987. They distributed a questionnaire to tournament participants and fishing club members, individuals they termed “avid” users. The survey was designed to determine how far respondents were willing to travel to oil and gas platforms to fish or dive. The study area followed the three regions (Delta, Bay, and Cameron) described above for Ditton and Auyong (1984). A total of 244 responses were received and analyzed for this study.

Gordon (1993) used a standardized questionnaire to determine characteristics of travel (over water) by recreational anglers and divers in the central GOA. His study was also based on the three-region study area used by Ditton and Auyong (1984). The database assembled included 200 interviews made at 16 different launch sites in coastal Louisiana during July and August 1985. The study obtained the locations of platforms or lease blocks visited from the interviews. Distances were calculated from launch site to first platform, platform to platform, and distance for the entire trip.

A more recent survey conducted in 2013 examined use of artificial reefs (including oil and gas platforms) by registered boaters and anglers in Texas (Schuett et al. 2015; Schuett et al. 2016). Questionnaires were mailed to a sample of 7,000 individuals drawn randomly from a pool of 14,000: the sum of 7,000 registered boaters (with boats >26 ft long) and 7,000 registered saltwater anglers. The detailed questionnaires included questions about the trip location by lease block and reef site (including platforms), distance traveled, launch point, and home port.

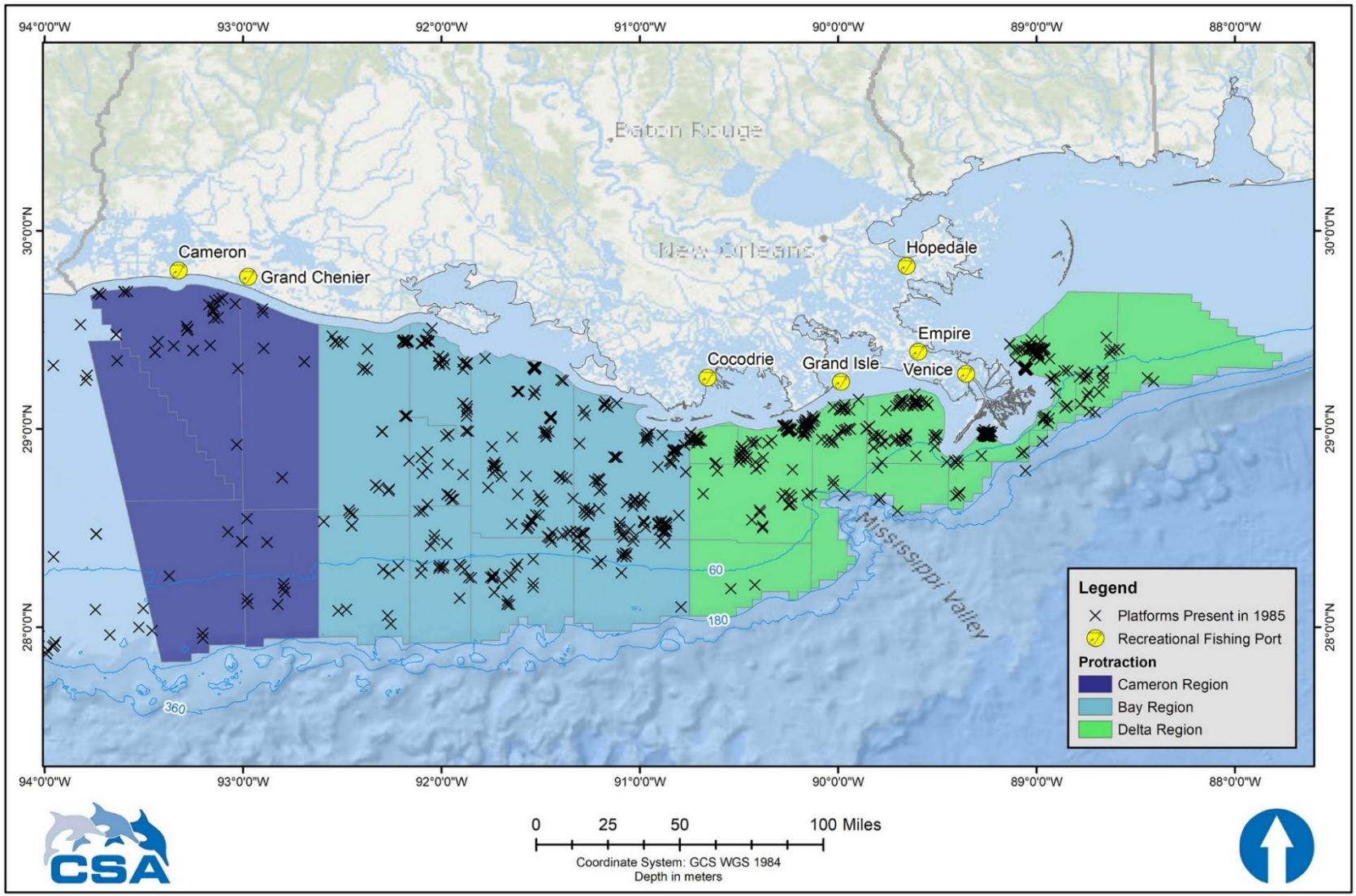

Figure 3-1. Central GOA areas used to study recreational activities at oil and gas platforms
Source: Ditton and Auyong (1984); Stanley and Wilson (1989); and Gordon (1993)

3.1.1 Recreational Uses of Platforms

Reviewed resources describing recreational uses of platforms as artificial reefs focused on two primary uses: recreational fishing and recreational diving (e.g., Stanley and Wilson 1989; Continental Shelf Associates Inc. 2002; Kolian and Sammarco 2005; Snodgrass et al. 2020).

3.1.1.1 Recreational Fishing

Within recreational fishing, there are differences in platform use among private vessels and charter vessel operations, particularly related to the size and range of vessels. Larger vessels may be more likely than smaller private vessels to target platforms (and platforms converted to artificial reefs) further offshore.

3.1.1.2 Recreational Diving

Oil and gas platforms, presumably including platforms converted under Rigs-to-Reefs, are important to recreational divers, including free divers and spearfishers, because there are few suitable hardbottom areas or natural reefs in the northern GOA (Stanley and Wilson 1989). Recreational diving operations on abandoned offshore platforms are also differentiated by private party trips and commercial charters. It was clear from the literature review that recreational diving was a main recreational use of artificial reefs, as referenced in older 1980s records and was regularly advertised through local dive and charter boat companies; however, no recent data were identified that would provide spatially explicit location data for these dives or address the objectives of this study.

3.1.1.3 Other Recreational Uses

Other forms of recreation that might be possible at converted oil and gas platforms (based on a broad review of social media posts for recreational uses at oil and gas platforms) include both nearshore recreational (i.e., sea kayaking, and paddleboarding) and offshore recreation (i.e., cruising, sightseeing, marine wildlife and pelagic bird tours). However, no definitive data were readily available that would meet the objectives of this study.

3.1.2 Magnitude of Platform-based Recreation

A limited amount of information related to the magnitude of platform-based recreation has been described by Ditton and Auyong (1984) and Stanley and Wilson (1989). These sources describe the magnitude of use as a proportion of total recreational activities in the area (e.g., fishing and diving).

3.1.2.1 Recreational Fishing

Witzig (1986) reported that 37% of all fishing trips (inland and offshore) made by coastal residents of Louisiana were within 200 ft of an oil and gas platform. About 70% of fishing trips made by Louisiana private boats into the open gulf (>5.6 km [3 nmi] from shore) were around oil and gas platforms. An estimated 72% of Louisiana charter boat trips made to the open Gulf fished near oil and gas platforms. About 28% of trips by Texas coastal residents in 1984 were within 200 ft of a platform. Witzig (1986) stated that data were being collected for the year 1985; however, no formal reports or accounts of these data were found during the literature search.

Hiett and Milon (2002) reported a mean of 20% of all recreational fishing trips in private boats from Alabama, Mississippi, Louisiana, and Texas were made within 300 ft of an oil and gas platform. Mean percentage of private vessel fishing trips to oil and gas platforms (41.4%) was highest in Alabama (209,333 of 505,635 trips), followed by 19.7% for Mississippi (99,986 of 507,545 trips), 17.3% for Texas (170,621 of 986,250 trips), and 16.6% for Louisiana (343,135 of 2,067,076 trips). The mean number of overall charter boat trips for these same four states targeting oil and gas platforms averaged

32.3% (96,337 of 298,023 trips). Texas charter boats lead the way with a mean of 51.8% trips (53,578 of 103,443 trips) visiting platforms. Louisiana charter boats averaged 23.1% (17,041 of 73,770 trips), followed by Mississippi at 21.7% (10,725 of 49,426 trips), and Alabama at 21.0% (14,993 of 71,394 trips).

Ditton and Auyong (1984) reported one-way, straight-line distances for trips to platforms in the Delta region averaged 12.0 mi for private boats and 16.3 mi for charter boats. In the Bay region, private boats averaged 21.6 mi per trip and charter boats averaged 38.5 mi per trip (one-way, straight-line distances). Distances traveled were greatest in the Cameron region, where private boats averaged 29.0 mi per trip, charter boats averaged 40.7 mi per trip, and dive boats 47.7 mi per trip.

Stanley and Wilson (1989) reported that anglers in Louisiana traveled an average of 62 km (straight-line, one-way) offshore to fish around offshore platforms. The breakdown of average one-way distances for shore to oil and gas structures anglers traveled by region was Delta (53.56 km), Bay (46.93 km), and Cameron (65.54 km). Anglers preferred West Delta, South Timbalier, Vermilion, and West Cameron lease block areas.

Most (54.5%) of Gordon's (1993) respondents tied directly to platforms during their trips, 30.0% trolled near platforms, and 5% dived at platforms. Anglers fishing at platforms reported a mean distance of 34.2 km (21.3 mi) from launch site to the first platform, and an additional mean distance of 21.3 km (13.2 mi) traveling to other platforms during the trip. The mean total trip length was 96.8 km (60.1 mi) for anglers that tied to the platforms. The mean trip length for offshore trollers and blue water anglers was 104.5 km (64.9 mi). The farthest offshore respondents were willing to go was 50 km (31.0 mi). The average distance between platforms was 3.3 km (2.0 mi). Most of the respondents operated vessels less than 8 m (24 ft) long. It is important to note the distinction of this study in not using only straight-line distances from launch point or shore. A typical offshore trip is certainly more than a straight-line course in and out of port. Anglers participating in competitive tournaments moved around by more than 40% when compared with non-tournament anglers. Travel within the *de facto* artificial reef setting of offshore platforms is likely to be greater than travel within an equally distant artificial reef deployment where crowding of boats could happen.

Schuett et al. (2015) reported responses for distances traveled to artificial reefs (including platforms) in distance from shore (miles) classes: 1–10 (30.2%), 11–20 (19.0%), 21–30 (20.7%), and >30 (30.0%). The distribution of these responses was bimodal, with 1.6 to 16.1 km and >48.3 km (1 to 10 and >30 mi) forming the two modes at about 30%. The primary Texas ports used by respondents were Galveston (27.9%), Port Aransas (25.9%), and Freeport (22.6%).

3.1.2.2 Recreational Diving and Other Recreational Uses

We reviewed the available recreation opportunities for nearshore and offshore oil platforms in each state and who the management agency is for each site-specific location—both the sources and destination for the recreation activity. Specific seasonality, management activities, programs, or prohibitions that involve, target, or quantify recreation activities were considered for their high value to understanding platform-based recreation.

Hiett and Milon (2002) survey found a total of 89,464 dive trips were made from Alabama (11,124 trips), Mississippi (11,166 trips), Louisiana (45,476 trips), and Texas (21,298 trips) during 1999. Of these, 100% of trips from Louisiana, Mississippi, and Texas and 48.9% of trips from Alabama were made around oil and gas platforms.

Stanley and Wilson (1989) reported average one-way distances traveled by divers by region was Delta (42.79 km), Bay (55.35 km), and Cameron (122.54 km). Divers preferred Main Pass, West Delta, South Timbalier, and Ship Shoal protraction areas.

Other recreational uses of platforms include both nearshore recreation (i.e., sea kayaking, and paddleboarding) and offshore recreation (i.e., cruising, sightseeing, marine wildlife/pelagic bird tours). However, recent substantive literature regarding recreational uses other than fishing and diving that would address the objectives of this study were not readily available.

3.1.3 Site-specific Determinants of Platform-based Recreation

The literature review found that determinants of platforms targeted for platform-based recreation (e.g., location, type of structure) were evaluated and described by a number of sources (e.g., Ditton and Auyong 1984; Franks 2000; Wilson et al., 2003). Certain factors, such as hypoxic events, were not shown to be largely influential on fish communities around platforms (e.g., Reeves et al. 2018) and thus may not be a direct driving factor in platform selection or use.

3.1.3.1 Recreational Fishing

Wilson et al. (2003) indicated that the profile and orientation of a platform, once converted to an artificial reef structure, had significant influence on the marine community structure, which in turn may influence recreational use. Determinants of platform use for recreational fishing (e.g., location, type of structure) also included temporal considerations and seasonal environmental events (e.g., increased water temperatures) (Stanley and Wilson 1989; Franks 2000), proximity to population centers and infrastructure, and distance from shore (Ditton and Auyong 1984). The findings from these sources were used when formulating the interview questions for exploratory discussions.

Key determinants of platforms targeted for platform-based recreation (i.e., platform type, method of decommissioning, water depth) were evaluated and described by the small-scale studies (e.g., Ditton and Auyong 1984; Stanley and Wilson 1989; Gordon 1993) but not those determinants based on MRFSS. Ditton and Auyong (1984) indicated water depth, distance from shore, and proximity of population centers were the most important factors affecting platform use by recreational anglers. They found broad factors (such as those relating to weather—wind velocity, precipitation, and air temperature) correlated with use by recreational anglers. Site-specific factors (including distance from shore, water depth, relative size, and type of production) were not significant predictors of vessel distribution in the study area. The authors noted the nature of their data set (which included no random samples from a population of platforms) precluded a rigorous analysis of these factors. Their observational data showed recreational activity (density of boats) was clustered around platforms closest to shore-based access points and population centers. They also observed recreational activity radiated seaward from platforms with clustered activity. This pattern was most prevalent at platforms in the Delta region and near major population centers (New Orleans and Baton Rouge, Louisiana).

Anglers interviewed by Gordon (1993) reported past success (58%), variety of species (25%), and friends' recommendations (20%) to be the top reasons for choosing platforms during a trip. Site-specific platform characteristics were much less important to this group of interviewees: water clarity (13%), water depth (6%), distance from shore (6%), and size of platform (0.5%).

Offshore Texas in 2013, anglers using artificial reefs reported the mean percentage of trips, in ascending order, were to standing oil production structures (39.3%), natural reefs or topographical features (20.8%), toppled or submerged production structures (12%), and liberty ships and other submerged vessels (11.9%) (Schuett et al. 2015). Site-specific factors influencing choice of fishing sites were categorized into a range of classes from least important to most important. Those factors for "very important" were water depth

(43.7%) and water clarity (38.8%); "extremely important" were presence of desired fish (58.7%), and "most important" were distance from port (32.8%) and presence of desired fish (35.0%).

Schuett et al. (2015) showed a bimodal distribution of water depth preferences among Texas users of artificial reefs. One group wanted to be as close to port as possible (usually 16.1 km [10 mi] or less) while still being in water depths where target fish species could be found. The second group wanted to be at least 48.2 km (30 mi) from shore to reduce the number of other boaters, enhance the experience, and be in water depths where target species can be found.

Based on the general review of available literature and an understanding of fishing, a number of site-specific determinants have been identified that can influence recreational fishing in the GOA:

- Distance from port
- Vessel type (private, charter or party boat)
- Presence of targeted species
- Water depths
- History of fishing success at platform
- Type of platform
- Decommissioning method
- Weather conditions
- Water temperature and quality
- Localized currents

3.1.3.2 Recreational Diving and Other Recreational Uses

Less information pertaining to site-specific aspects of diving trips to platforms were available from the reviewed literature when compared to information about fishing. A primary determinant for recreational diving was the proximity of popular beach or port locations to oil and gas platforms. Other determinants considered included specially designated areas (e.g., Flower Garden Banks National Marine Sanctuary, state beaches, National Wildlife Refuges), commercial shipping traffic lanes, public access, offshore distance, water turbidity, public rental facilities, and oil exploration and development activity.

Divers generally sought platforms farther from shore than anglers (Ditton and Auyong 1984; Stanley and Wilson 1989). Divers generally were motivated to travel greater distances along the water depth gradient in search of clear water and preferred species for spearfishing (e.g., snappers, groupers) (Stanley and Wilson 1989). Distant sites also experienced less fishing pressure from recreational anglers, but commercial vessels fished at platforms farther from shore than recreational anglers (Ditton and Auyong 1984). Presence of commercial vessels may influence divers' choice of platform during a trip; however, levels of competition between commercial anglers and recreational divers is unknown.

Site-specific determinants for recreational divers are those factors that users would consider as being beneficial (leading them to consider a dive) or adverse (leading them to potentially avoid a dive). Many of these determinants are the same as those influencing recreational fishing. Designated diving areas (e.g., Flower Garden Banks National Marine Sanctuary, state beaches, National Wildlife Refuges) influence diving activities because having multiple options can seem more attractive to divers. Flower Garden Banks National Marine Sanctuary, located 160.9 km (100 mi) off the Texas and Louisiana coasts, is the most popular diving destination in the study area (NOAA 2021). Often, dive trips to this National Marine Sanctuary include platform trips and dives.

Public access points, with attendant equipment rental facilities, and relatively close distances to platforms can influence selection of recreational dive locations (e.g., difficult locations to reach are less likely to be used than easier to reach locations). Water and weather conditions can affect water visibility and dive

safety, and divers would be expected to choose dive sites based on these localized conditions. The presence of offshore oil and gas platforms is an assumed determinant because these facilities provide in-water structure that attracts marine life appealing to recreational divers. Shipping and boating intensity may affect recreational divers, but only negligibly for platforms, because they are not located within these areas. Another influential determinant is location or accessibility. Offshore platforms in the study area ranged from approximately less than 1.6 km (1 mi) to over 201.2 km (125 mi) offshore.

Based on the general review of available information and an understanding of diving and other recreational uses, we identified a number of site-specific determinants that can influence recreational diving and other non-fishing recreation in the GOA:

- Distance from port or boat launch facilities
- Water depths
- Presence of reefed structures
- Dive site popularity
- Shipping and boating intensity
- Weather conditions
- Water temperature and quality
- Localized currents
- Recreational fishing intensity

3.1.4 Factors that Could Affect Trends in Platform-based Recreation

Factors that influence current and future trends in platform-based recreation were wide-ranging and are likely, albeit partially related site-specific determinants of platform-based recreation. Kaiser et al. (2020) noted the recent decline in oil and gas exploration in the northern GOA, which has resulted in an increase in decommissioning of platforms in the near-term.

3.1.4.1 Recreational Fishing

Conversion of decommissioned platforms to artificial reefs is supported by commercial and recreational fishermen, as well as coastal conservation organizations. However, costs, liability, and political climate could also have a large influence on the conversion of platforms to artificial reefs (Cripps and Aabel 2002; McGinnis 2005; Kolian et al 2018). The growing body of research on the influence of artificial reefs and, in particular, converted platforms (Rezek et al. 2018; Schulze et al. 2020) on the surrounding marine ecosystem will also likely influence the scale of conversion and ultimately trends in use.

Indirect factors such as the economic climate, recreational fisheries regulations, and vessel technologies may also have a substantial influence on future trends in platform-based recreation. The trend of extractive energy exploration into deeper water could also alter the recreational use of platforms due to distance from shore and have an influence on a different set of species than active and converted platforms in nearshore or shelf waters (Snodgrass et al. 2020).

3.1.4.2 Recreational Diving and Other Recreational Uses

There are many factors that may affect trends in recreational diving and other uses. These include natural and human-made disasters, restricted access, personal choice, among others. Trends in recreational diving at offshore platforms could reasonably be affected by restrictions related to oil spills and long-term changes in regional climate. Restrictions due to oil spills may result in limited dive trip opportunities or restricted access in affected areas. Long-term changes in seasonal conditions due to climate could alter typical hurricane seasonality, duration, and intensity, which in turn could impact diver access to, and safety near offshore platforms. Long-term changes in climate conditions could also reduce dive visibility

through increased storm intensity and alter fish distributions through increased water temperatures, which could affect marine species observable by divers at platforms.

Long-term data on other non-fishing recreation uses such as cruising, sightseeing, marine wildlife/pelagic bird tours, sea kayaking, and paddleboarding are not available. The factors discussed above that could affect long-term trends in diving also could affect these other recreation types. However, other recreation types could also be affected by advancements in technology. Technological advancement could improve onboard vessel navigation, electronic surveillance devices and other technology-dependent recreation types. Increased technology, coupled with social media, has the potential to increase recreational demand on offshore platforms by conveying the recreation opportunities to a wider audience.

The ability for information to be attributed with usable data (e.g., spatial data downloads, or GIS- and global positioning system (GPS)-friendly software downloads) influences the ability of the end user to correctly orient or map their own activities. The access to usable data, as well as other factors similar to those that affect trends in platform-based recreational fishing, also will likely influence other current and emerging recreational uses such as cruising, sightseeing, marine wildlife/pelagic bird tours, sea kayaking, and paddleboarding.

3.1.5 Other Related Issues

Future impacts from continued and additional recreational use of platforms as artificial reefs in the northern GOA may include ecological, economic, and social impacts (Ajemian et al. 2015; Cripps and Aabel 2002; Scarborough Bull et al. 2008). Increases in boat fuel prices as experienced in 2022 could also limit recreational use of platforms.

3.1.5.1 Recreational Fishing

One impact associated with an increase in recreational fishing pressure was highlighted in Cowan and Rose (2016). They postulated that although platforms may contribute to spawning stock biomass of some species, this increase can be easily offset by increased fishing pressure. Platforms may increase fishing mortality on species such as red snapper by providing an obvious visual marker of where to fish, concentrating fish, and thereby increasing fishing efficiency (and subsequent fishing mortality).

3.1.5.2 Recreational Diving

No direct information on potential future issues stemming from recreational diving was found in the literature. However, it is reasonable to assume that increasing participation in all recreational activities, in a resource limited environment, could result in user conflicts.

3.1.5.3 Other Recreational Uses

It is likely that future impacts stemming from other nearshore recreation (i.e., sea kayaking, and paddleboarding) and offshore recreation (i.e., cruising, sightseeing, marine wildlife/pelagic bird tours) will not be substantial. However, gathering information on potential emerging recreational use of platforms and Rigs-to-Reefs structures was attempted during the exploratory discussion task (**Section 3.3**).

3.2 Findings from Geospatial and Agency Data Review

Key findings of the data review are summarized in the following sections based on the overall objectives of the study as well as by recreational use. The data review focused on presenting information on the following:

- Relative abundance of oil and gas platforms for recreational activities
- Location and magnitude of platform-based recreation
- Factors that could affect trends in platform-based recreation
- Identification of recreational use of decommissioned platforms that have been reefed-in-place

3.2.1 Relative Abundance of Oil and Gas Platforms

Oil and gas platforms on the OCS offer opportunities for recreational activities, particularly in protraction areas that are proximal to coastal ports. Platforms closer to shore would presumably be more advantageous for day trips by charter vessels or recreators using personal boats. To examine and visualize the density of platforms with respect to protraction area and distance from shore, we used the authoritative data sources described in **Section 2.2.1** to plot the latitude and longitude of existing platforms, then colorized the protraction areas according to the number of platforms. The distribution and relative density of existing oil and gas platforms within each of the protraction areas within the GOA is shown in **Figure 3-2**.

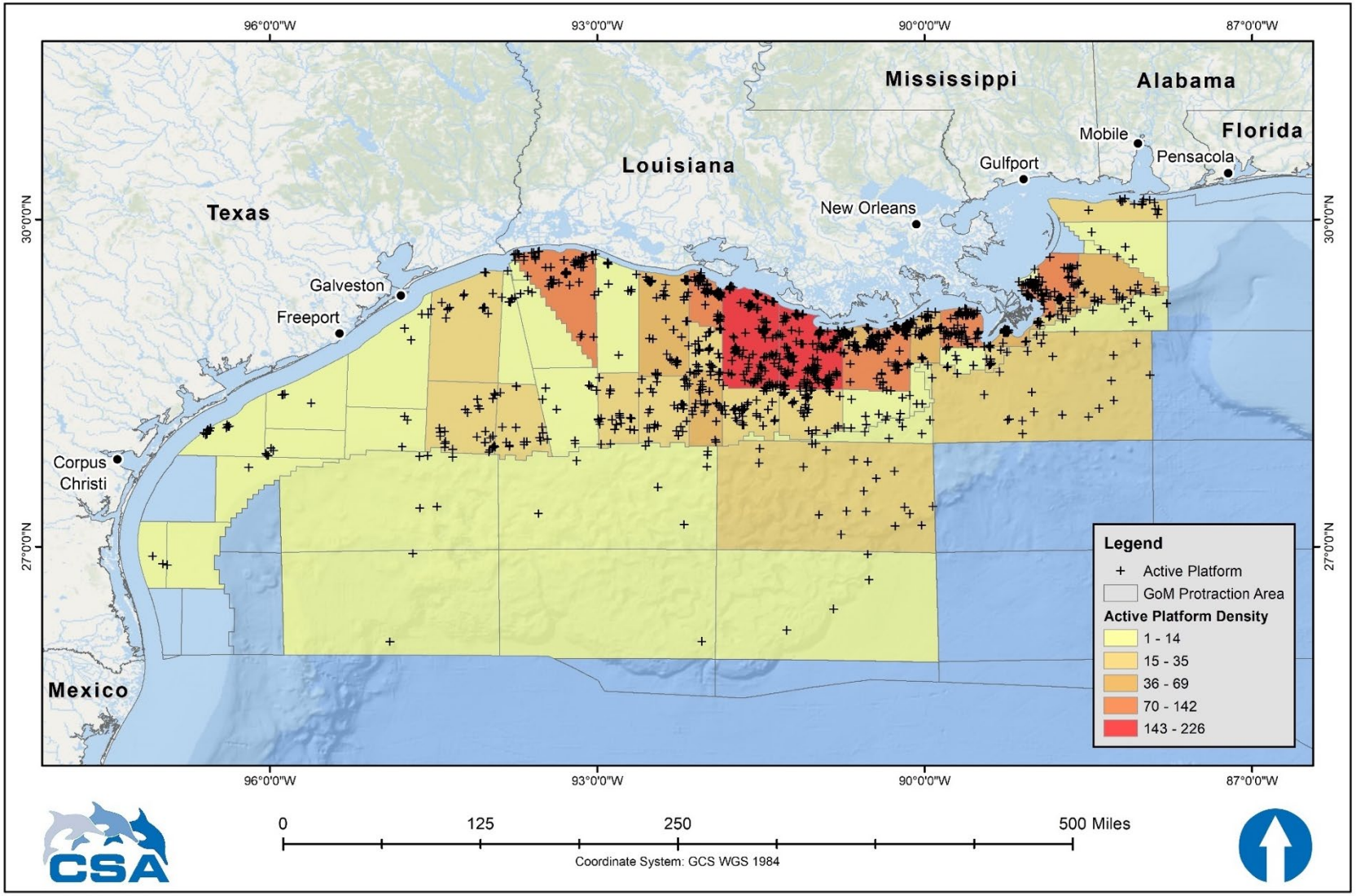

Figure 3-2. Distribution of active oil and gas platforms in Federal waters of the GOA
Source: online BSEE OID data (BSEE 2021)

3.2.2 Magnitude and Location of Platform-based Recreation

The geospatial data review found that the majority (92%) of the existing 1,756 oil and gas platforms on the OCS lie in water depths less than 100 m, with a range from 2 to 2,867 m (6.6 to 9,406 ft), a mean depth of 70 m (229.7 ft), and a median depth of 18 m (59.1 ft). With respect to distance from shore, the platforms range from 4.8 to 341.2 km (3 to 212 mi) from the nearest shoreline, with a mean distance of 46.7 km (29 mi) and median distance of 25.8 km (16 mi).

The protraction areas with the greatest number of platforms are shown in red and orange in **Figure 3-2**, including Ship Shoal Area (226 platforms); Eugene Island Area (200 platforms); South Timbalier Area (142 platforms); South Marsh Island Area, North Addition (113); Main Pass Area (102); West Delta Area (90 platforms); and West Cameron Area (85 platforms). All these platforms lie within 120.7 km (75 mi) of the coast of Louisiana.

3.2.2.1 Recreational Fishing

Many recreational fishing trips made within GOA Federal waters target oil and gas platforms (e.g., Schuett et al, 2016; Hiatt and Milon, 2002). There are numerous ports along the shores of Texas, Louisiana, Mississippi, and Alabama that support recreational fishing activities in the Western and Central GOA (**Figure 3-3**). A summary of the recreational fishing associated with oil and gas platforms in the GOA—including the types of recreational fishing (i.e., private, charter, party boat), fishing methods, and targeted species—is presented in **Table 3-1**.

Table 3-1. Summary of the recreational fishing types, methods, and targeted species common near oil and gas platforms in the GOA

Recreational Fishing Type	Fishing Methods	Targeted Species
Private boat	Rod and reel Electric reel Trolling Spearfishing (standard and powerhead)	Snappers (e.g., red and gray) Sheepshead Groupers Tunas (e.g., blackfin and yellowfin) Other pelagic fish (i.e., king mackerel, Spanish mackerel, cobia, and dolphin)
Charter boat	Rod and reel Electric reel Trolling Spearfishing (standard and powerhead)	Snappers (e.g., red and gray) Groupers Tunas (blackfin and yellowfin) Other pelagic fish (i.e., king mackerel, Spanish mackerel, cobia, and dolphin)
Party boat	Rod and reel	Snappers (e.g., red and gray) Groupers Sheepshead Other pelagic fish (i.e., king mackerel, cobia, and dolphin)

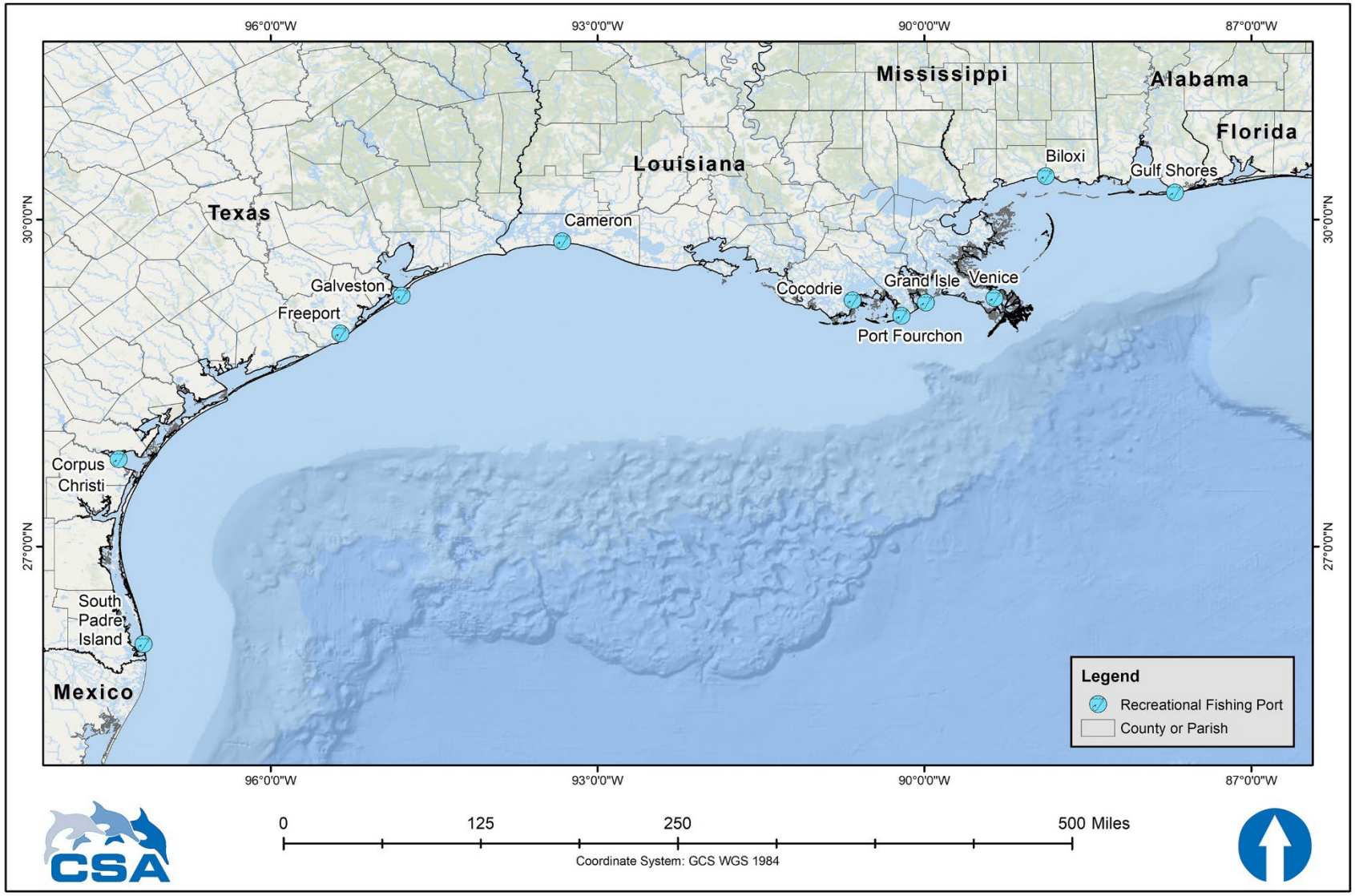

Figure 3-3. Location of primary ports (points-of-origin) used for recreational fishing in the Western and Central GOA
Source: online search of websites of charter fishing operations

To highlight temporal trends, fishing trips made by private and charter boats to offshore waters were obtained from an MRIP query for numbers of annual trips made from 2000 to 2021 off the three Central Planning Area states (Texas, which is the Western Planning Area, does not participate in the MRIP). **Figure 3-4** presents the trends over the past 20 years in the proportion of fishing trips by two categories of fishing area representing the demarcation between state (inshore, ≤5.6 km [3 nmi] from shore) and Federal waters (offshore, >5.6 km [3 nmi] from shore) by fishing mode (charter or private boat) for each state. The plot illustrates offshore trips (ostensibly including those to offshore platforms) were proportionately higher in Alabama than in Louisiana or Mississippi for both private and charter boats. Most anglers in Louisiana and Mississippi fished in inland waters (in estuarine habitats, such as bays, creeks, and marshes). Louisiana and Mississippi have a greater expanse of inshore habitat suitable for spotted seatrout, redfish, and other inshore species than Alabama. In each state, charter boats made more trips to offshore waters than did private vessels. Similar patterns were reported by Hiett and Milon (2002) for 1999 for overall recreational effort.

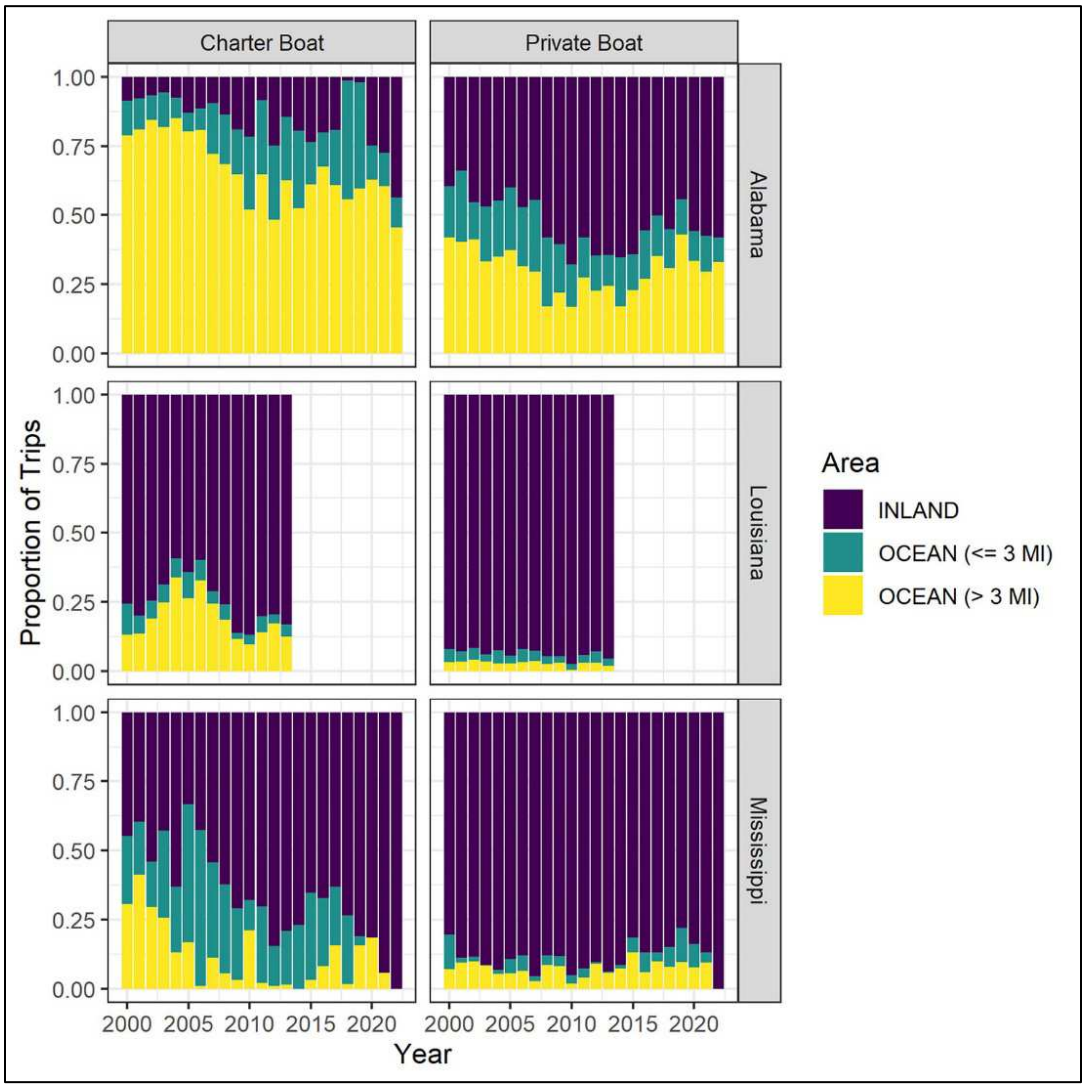

Figure 3-4. Proportion of recreational fishing trips made from Alabama, Mississippi, and Louisiana to inland, ≤5.6 km (3 nmi) from shore, and >5.6 km (3 nmi) from shore from 2000 to 2021
Source: NOAA Fisheries 2021a; R Core Team 2020

Plots of trends in recreational trips made >5.6 km (3 nmi) from shore for the three Central Planning Area states are shown in **Figure 3-5**. Data are plotted on the $\log_2$ scale to allow comparisons between the three states with different average numbers of trips. Trends were minimal, as indicated by the regression lines. Regression statistics are given in **Table 3-2**. The only statistically significant relationship was for Louisiana private boat trips which have declined an average of 3.3% over the 2000 to 2020 period (**Table 3-2**). Since the 1999 survey of Hiett and Milon (2002) the region has experienced multiple hurricanes including, Katrina, Rita, Gustav, Ike, Isaac, Harvey, Irma, Nate, Ida, Laura, Zeta and Delta; in 2010, the region experienced the *Deepwater Horizon* oil spill, which depressed both charter and private boat activity for some time. These events, coupled with seasonal quotas on target species such as red snapper, likely contributed to the fluctuations in trip numbers.

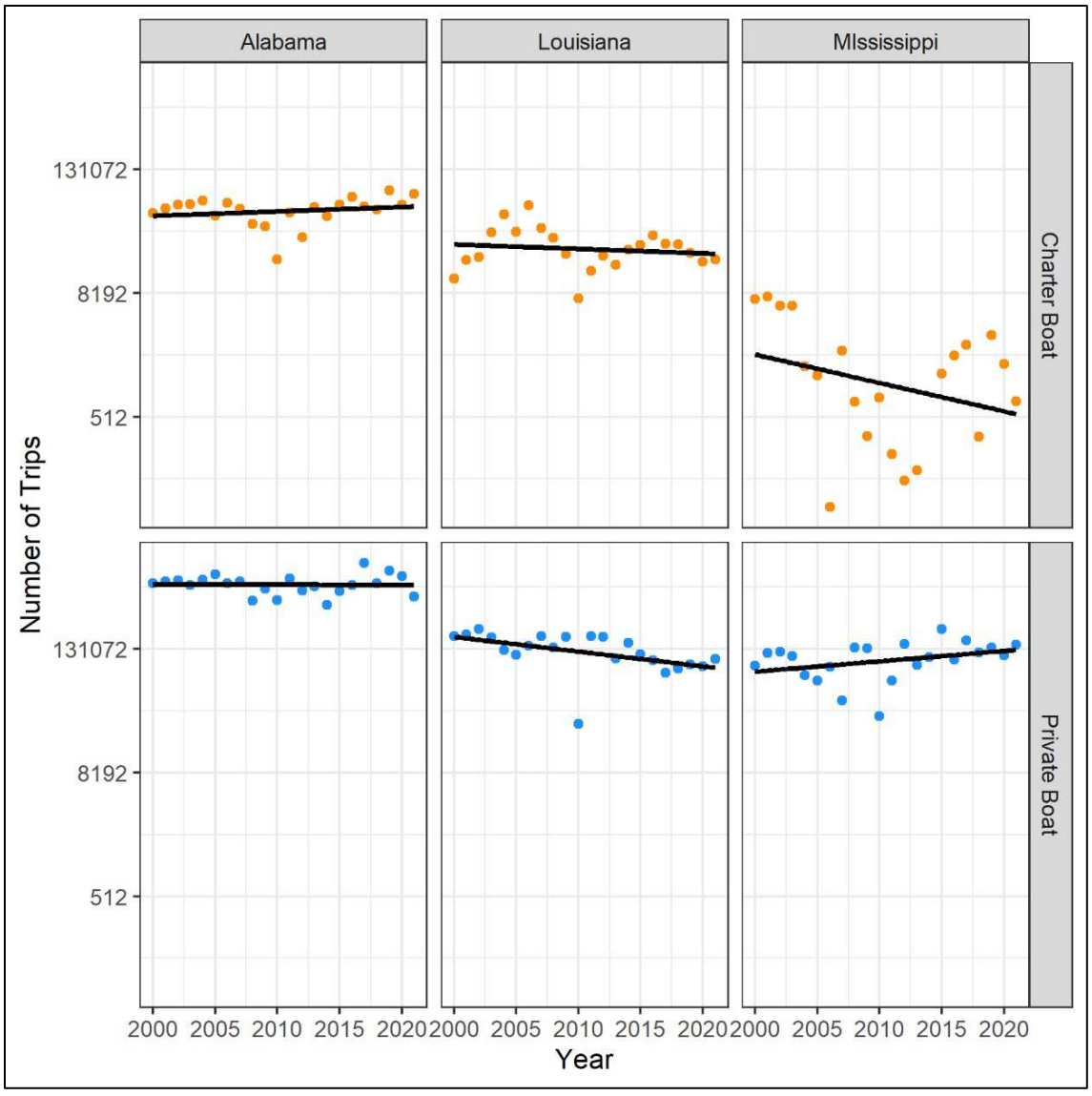

Figure 3-5. Trends in trips made by recreational anglers to offshore waters in the GOA
Y-Axis is $\log_2$. Black lines computed from simple linear regression.
Source: NOAA Fisheries 2021a; R Core Team 2020

Table 3-2. Results of linear regression of log_2 transformed recreational fishing trips per year made to offshore waters (>5.6 km [3 nmi] from shore) of Alabama, Louisiana, and Mississippi over time (2000–2021)

State	Mode	Coefficient (slope)	Standard Error	t-statistic	p value	R^2
Alabama	Private	-0.042	0.026	-1.62	0.12	0.069
Alabama	Charter	-0.058	0.044	-1.31	0.206	0.031
Louisiana	Private	-0.048	0.020	-2.36	0.029	0.178
Louisiana	Charter	-0.014	0.023	-0.63	0.538	-0.029
Mississippi	Private	0.034	0.021	1.58	0.129	0.067
Mississippi	Charter	-0.092	0.066	-1.38	0.183	0.043

P values in bold indicate statistical significance ($p<0.05$).
Sources: MRIP 2019; Louisiana Department of Wildlife & Fisheries 2021

3.2.2.2 Recreational Diving and Other Recreational Uses

Diving takes place in the study area, but the sport is not as intensely practiced as fishing. No recent quantitative data are available to inform the location or intensity of recreational diving in the study area; however, diving is regularly advertised through local dive and charter boat companies. By reviewing available online information and websites, we found that diving in the study area is pursued individually and commercially. South Padre, Galveston, and Freeport, TX, and Mobile, AL, have enterprises offering services with marina-based operations. There are many other dive operators located inland (especially in the Houston, TX, area) that charter trips. South Padre and Galveston, TX, are the two primary ports with diving companies regularly operating that also include offshore platforms as dive locations.

Existing platforms in the study area are available for recreational diving, subject to site-specific conditions or safety restrictions; this includes reefed-in-place platforms (partially removed or toppled), as well as those towed to another location (i.e., designated artificial reef areas). In general, platforms that are towed to a location are often mixed with other materials such as sunken ships/tugs/barges, and construction debris. These "artificial reef areas" are typically located in state waters and based on discussion with state Rigs-to-Reefs programs, are created to enhance ecological processes, and are not designed for recreational use.

The frequency, intensity, and locations associated with offshore platform-based diving is not tracked by state or Federal agencies; therefore, no quantitative assessment can be made. However, this review assumes that recreational diving at existing platforms is likely to be positively correlated with proximity to recreational ports. Recreational divers would either pursue this activity using their own personal boats and equipment, or they would charter the service from a local port. **Figure 3-6** shows the major coastal ports with commercial dive operations within the Western and Central GOA that would be used by recreational divers when traveling to and from dive sites, including platforms.

Other recreational uses of platforms include but may not be limited to cruising, sightseeing, marine wildlife/pelagic bird tours, sea kayaking, and paddleboarding. Most of the platforms are out-of-reach for non-motorized recreation (i.e., sea kayaking, and paddleboarding); however, this type of use may occur for those platforms nearest the coastline, such as those near Galveston, TX, and the Mississippi Delta in Louisiana.

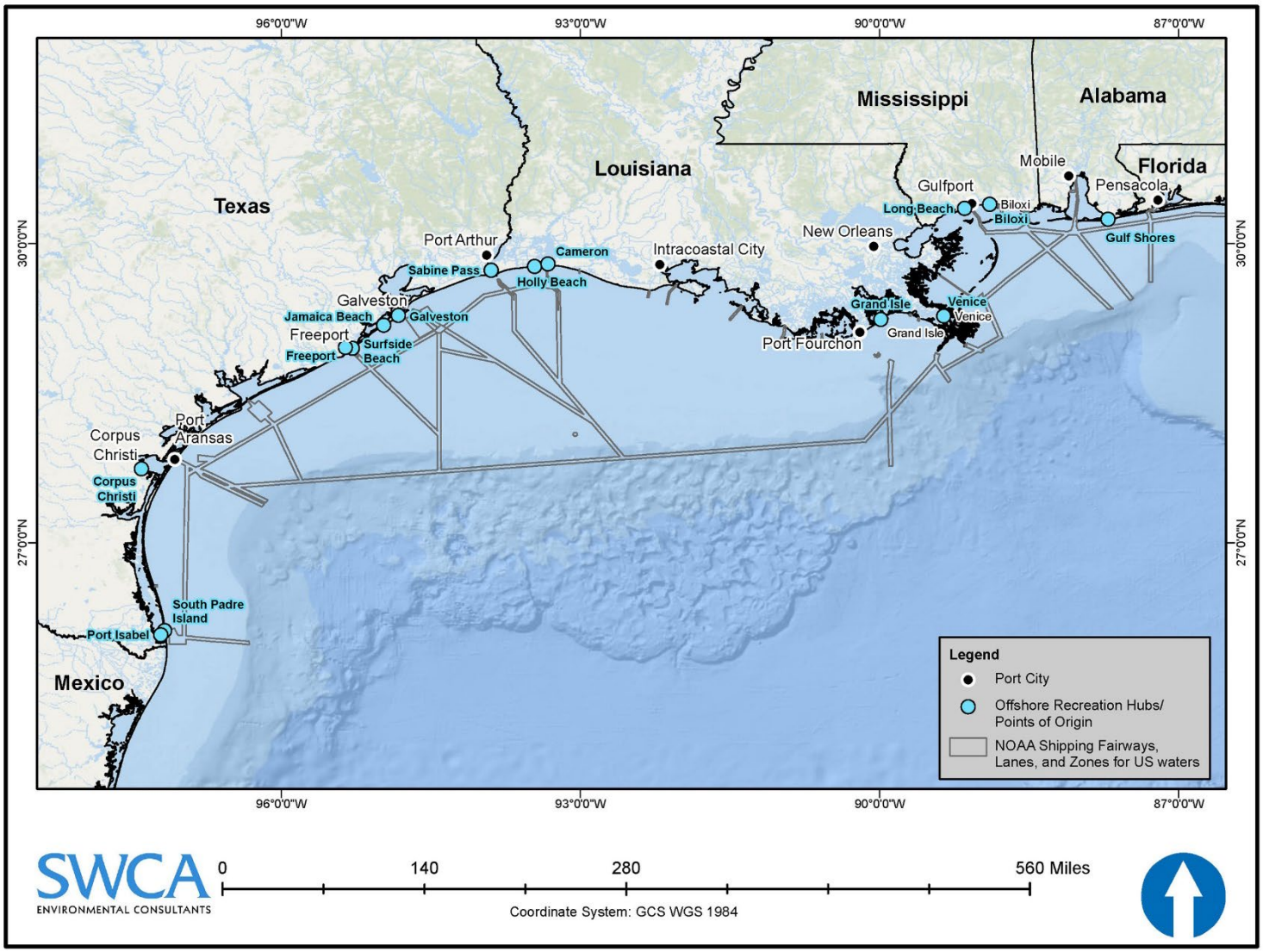

Figure 3-6. Location of primary ports (points-of-origin) used for non-fishing recreational uses in the Western and Central GOA
Source: online search of websites of diving operations

3.2.3 Site-specific Determinants of Platform-based Recreation

As discussed in **Section 3.1.3**, the literature review found that there are a number of site-specific determinants that can influence recreational use of oil and gas platforms in the GOA. Information from the geospatial and agency data review did not reveal any additional or unique information relative to site-specific determinants for platform-based recreational use.

3.2.4 Installation and Decommissioning Trends in Platform-based Recreation

Trends in recreation related to opportunities to visit platforms is of course dependent on the number and location of platforms, which affects not only their accessibility but also the number of recreators using a given platform. Kaiser et al. (2020) noted the recent decline in oil and gas exploration in the northern GOA and the potential effect on reducing the installation of new platforms while increasing the decommissioning of old platforms. Changing vessel fuel costs may also influence recreation intensity and frequency.

3.2.4.1 Platform Installation Trends

According to data obtained by querying the online BSEE OID, a total of 7,159 oil and gas platforms were installed in Federal waters between 1947 and 2020. Installations by year are summarized in **Figure 3-7**, illustrating the decline of platform installation in recent decades. Nearly four times fewer platforms were installed between 2009 and 2020 (12 platforms) than were installed in a single year in 2008 (45 platforms).

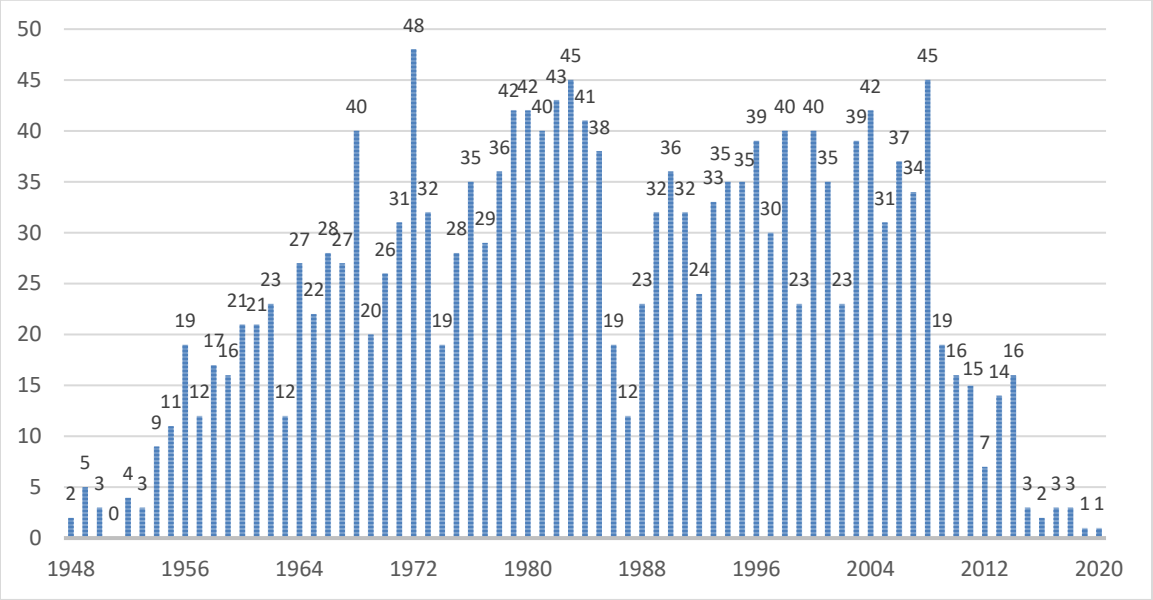

Figure 3-7. Offshore oil and gas platform installations by year in the GOA
Source: online BSEE OID data (BSEE 2021)

Platform Decommissioning Trends

According to the data received from the BSEE Technical Data Management Section, a total of 5,322 oil and gas platforms in Federal waters were decommissioned between 1973 and 2020. Decommissioned platforms by year are summarized in **Figure 3-8**, illustrating the disposition of these platforms: 90% (4,764) were removed to shore, and 10% (558) were transitioned to the Rigs-to-Reefs program. Of those transitioned to the Rigs-to-Reefs program, less than 4% (191) were reefed-in-place. **Table 3-3** provides further details on the trends in platform decommissioning based on water depth, with proportionally more rigs reefed than transported to shore with increasing water depth.

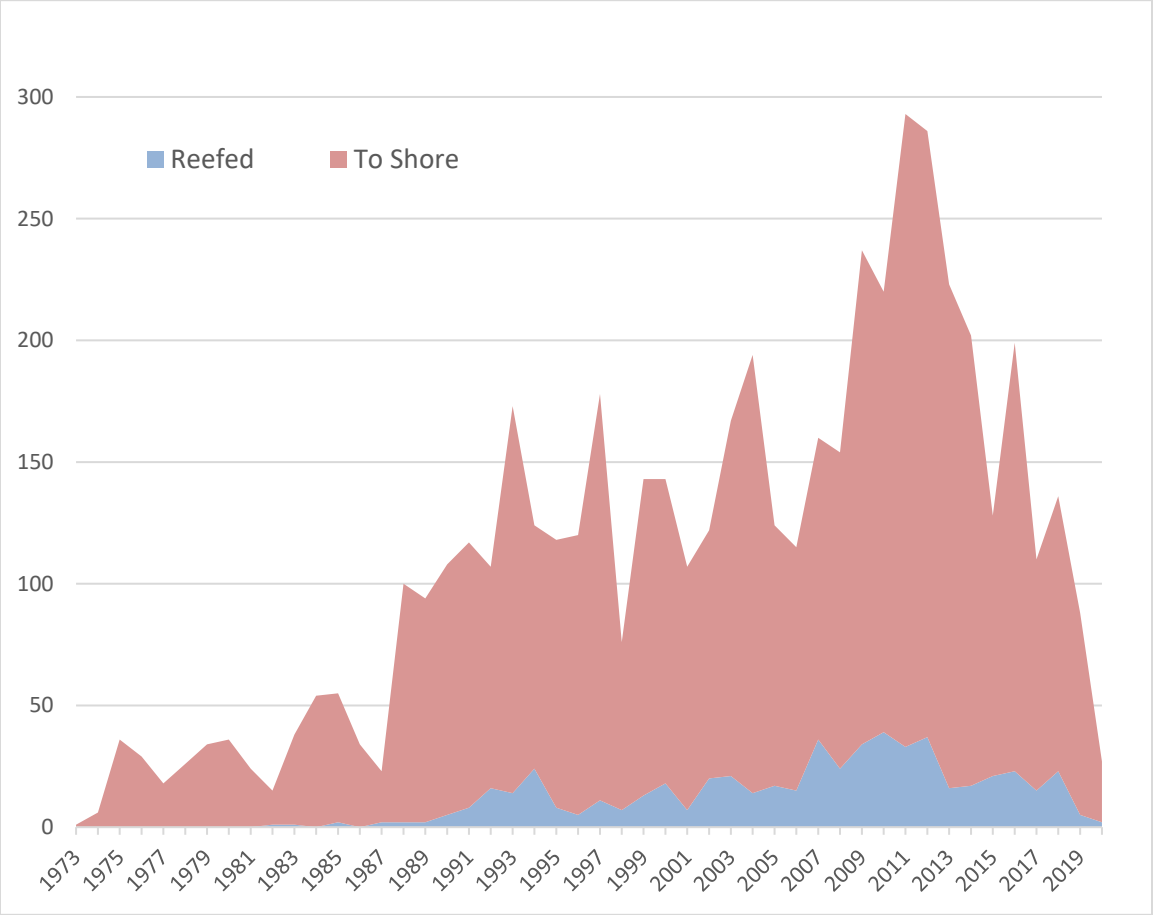

Figure 3-8. Offshore oil and gas platform decommissioning by year in the GOA
Source: spreadsheet data provided by the BSEE Technical Data Management Section, May 2021

Table 3-3. Oil and gas platforms decommissioned by year and water depth in the GOA

Year	< 30 m Reefed	< 30 m To Shore	30–45 m Reefed	30–45 m To Shore	45–60 m Reefed	45–60 m To Shore	> 60 m Reefed	> 60 m To Shore
1973	-	1	-	-	-	-	-	-
1974	-	6	-	-	-	-	-	-
1975	-	36	-	-	-	-	-	-
1976	-	26	-	1	-	1	-	1
1977	-	17	-	1	-	-	-	-
1978	-	22	-	4	-	-	-	-
1979	-	30	-	4	-	-	-	-
1980	-	31	-	3	-	1	-	1
1981	-	22	-	1	-	1	-	-
1982	1	11	-	3	-	-	-	-
1983	-	34	-	2	-	-	1	1
1984	-	45	-	-	-	7	-	2
1985	2	44	-	6	-	3	-	-
1986	-	30	-	2	-	2	-	-
1987	1	18	-	1	-	2	1	-
1988	-	84	1	8	1	4	-	2
1989	-	80	-	7	-	2	2	3
1990	-	82	1	12	1	6	3	3
1991	-	100	-	6	4	2	4	1
1992	-	79	3	3	7	7	6	2
1993	1	135	4	17	3	4	6	3
1994	7	70	9	17	6	11	2	2
1995	1	101	1	4	-	2	6	3
1996	-	102	1	6	2	6	2	1
1997	1	146	5	9	2	9	3	3
1998	-	57	-	6	3	4	4	2
1999	3	112	4	8	-	7	6	3
2000	3	83	2	30	6	6	7	6
2001	-	66	-	16	4	11	3	7
2002	-	89	2	9	6	1	12	3
2003	5	117	7	11	3	7	6	11
2004	-	149	1	17	7	11	6	3
2005	1	82	5	11	3	8	8	6
2006	1	82	3	16	2	-	9	2
2007	2	99	7	16	10	3	17	6
2008	1	102	11	11	7	9	5	8
2009	1	155	6	21	8	17	19	10
2010	-	128	3	29	10	18	26	6
2011	1	215	-	20	7	11	25	14

Year	< 30 m Reefed	< 30 m To Shore	30–45 m Reefed	30–45 m To Shore	45–60 m Reefed	45–60 m To Shore	> 60 m Reefed	> 60 m To Shore
2012	1	188	4	33	20	19	12	9
2013	-	176	-	17	5	4	11	10
2014	-	163	2	9	9	8	6	5
2015	1	88	5	10	9	6	6	3
2016	1	140	2	21	9	10	11	5
2017	-	69	3	20	2	3	10	3
2018	3	87	1	12	7	9	12	5
2019	1	55	-	14	-	10	4	4
2020	-	19	-	2	-	4	2	-
Subtotal	39	3,873	93	476	163	256	263	159
Total	< 30 m:	**3,912**	**30–45 m:**	**569**	**45–60 m:**	**419**	**> 60 m:**	**422**

Source: BSEE Technical Data Management Section provided data, May 2021

3.2.5 Identification of Recreational Use of Decommissioned Platforms that Have Been Reefed-In-Place

In 1984, the U.S. Congress signed the National Fishing Enhancement Act because of increased interest in fishing at offshore oil and gas platforms, and widespread support for artificial reef development by coastal states. As part of the Act, NOAA Fisheries developed a National Artificial Reef Plan. The Minerals Management Service, now BOEM and BSEE, subsequently adopted a National Rigs-to-Reefs policy in 1985.

All five Gulf Coast states have approved artificial reef plans in accordance with the National Artificial Reef Plan: Alabama, Florida, Louisiana, Mississippi, and Texas. BSEE is responsible for permitting, placement, and eventual removal of these facilities on the OCS. All five Gulf states have incorporated decommissioned platforms into their artificial reef programs; however, Louisiana and Texas are the primary participants in the Rigs-to-Reefs program since the majority of platforms are installed offshore of these two states. **Figure 3-9** illustrates the locations of artificial reefs on the OCS within the GOA.

Three general methods are used for removing and "reefing" a decommissioned platform: 1) tow-and-place, 2) topple-in-place, and 3) partial removal. Tow-and-place involves removing the platform from its original location and placing it in a designated location elsewhere (onshore or in an artificial reef area). This data review focuses on platforms decommissioned and reefed-in-place fit the following scenarios:

- Located on the OCS
- Partially removed, meaning the structure is cut off at some height below the water surface, typically 26 m (85 ft) deep and placed on the sea floor next to the base of the remaining structure
- Toppled-in-place, meaning the cut platform is laid out horizontally on the ocean floor near the location of the original platform

The density of decommissioned platforms that have been reefed-in-place (partially removed or toppled-in-place) within each of the protraction areas[2] within the GOA is shown in **Figure 3-10**. The majority (87%) of the 191 reefed-in-place structures on the OCS lie in water depths less than 100 m (328.1 ft), with a depth range from 17 to 341 m (56 to 1,119 ft), a mean depth of 69 m (226 ft), and a median depth of 60 m (170 ft). With respect to distance from shore, the platforms range from 17.7 to 210.8 km (11 to 131 mi) from the nearest shoreline, with a mean distance of 98.2 km (61 mi), and median distance of 104.6 km (65 mi). The protraction areas with the greatest number of platforms are shown in red and orange in **Figure 3-10**, including High Island Area-East Addition-South Extension (26 structures); Eugene Island Area-South Addition (22 structures); High Island Area-South Addition (17 structures); and South Timbalier Area (15 structures); all structures listed lie within 193.1 km (120 mi) of the coast of Louisiana.

[2] Where leasing maps have never been generated, we used the Official Protraction Diagram (OPD). A standard OPD is 1 degree in latitude by 2 degrees in longitude (at lower latitudes: 0–48 degrees), as in the GOM. OPD limits usually approximate the standard 1:250,000 scale U.S. Geological Survey topographic map series. The OPDs are numbered using the United Nations International Map of the World Numbering System. OPD names usually coincide with standard topographic sheet names when diagrams include land areas. OPD sheet names relate to land features or to hydrographic features contained within the limits of the diagram. Shoreline planimetric detail is shown when it falls within the limits of a diagram.

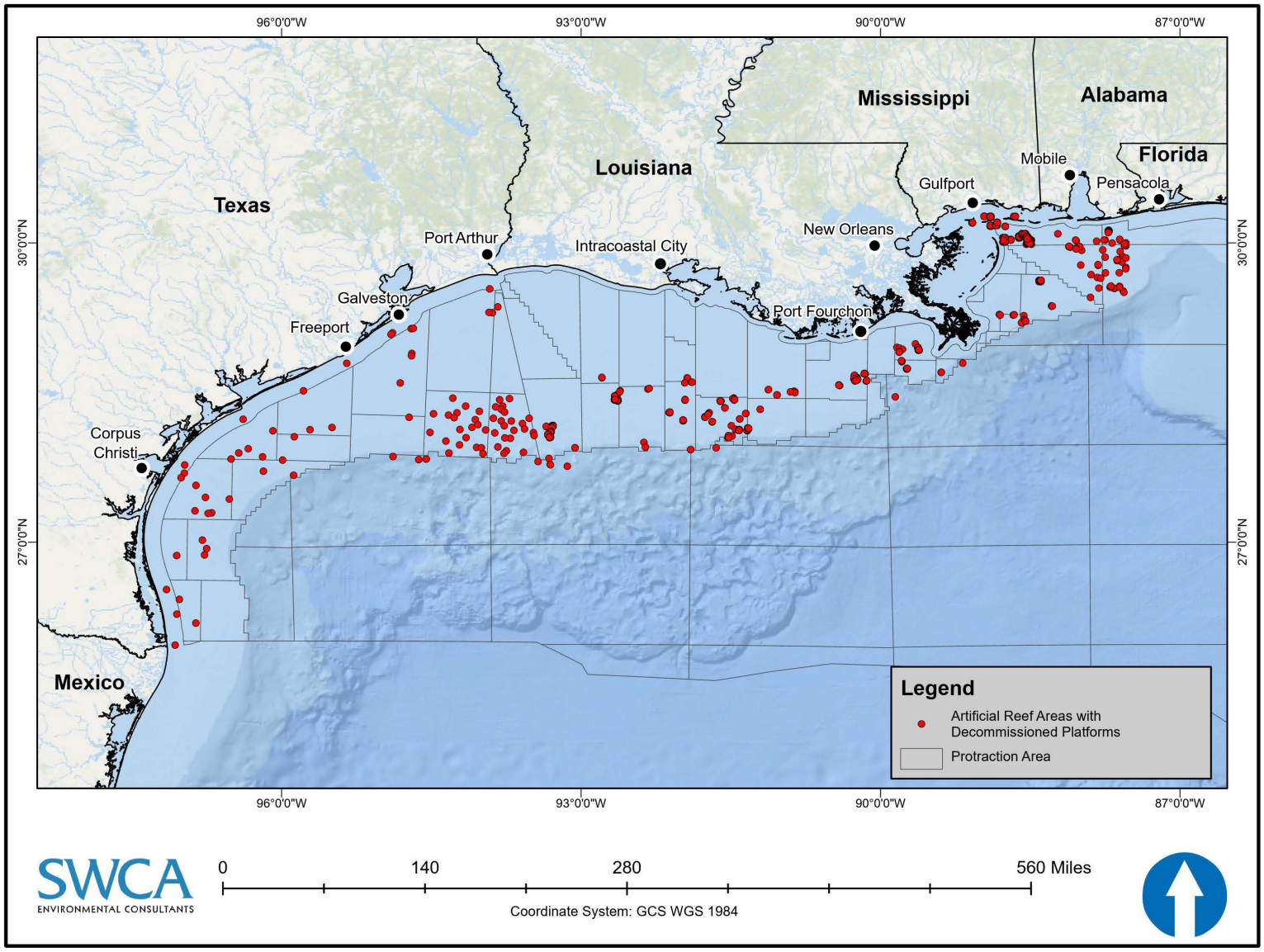

Figure 3-9. Location of Artificial Reef Areas on the GOA OCS
Source: online BSEE OID data (BSEE 2021)

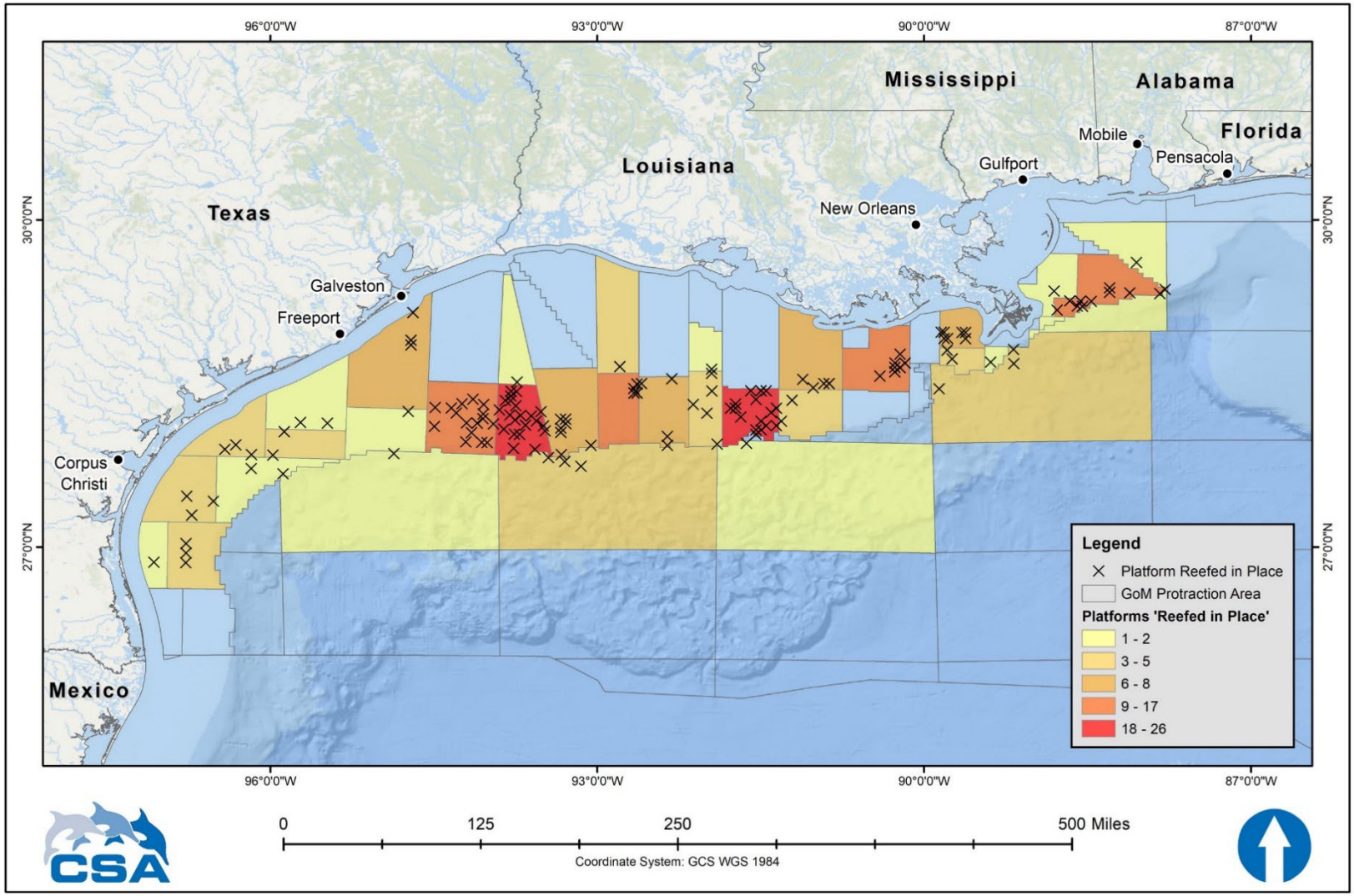

Figure 3-10. Density of reefed-in-place offshore platforms in the GOA, as identified by decommissioned deployment method of toppling or partial removal
Source: BSEE Platform Decommissioning Data

3.3 Findings from Small Group Discussions and Follow-up Conversations

The following sections summarize key findings from small group discussions and follow-up conversations organized by recreation type.

3.3.1 Recreational Fishing

A small group discussion was held with five key informants with knowledge of offshore recreational fishing, including individuals representing BSEE, the Louisiana and Alabama Rigs-to-Reefs programs, a state-level sport fishing non-profit organizations in Alabama, and a Louisiana-based researcher from a non-profit focused on developing sustainable uses for rig infrastructure. Key takeaways from the discussion are summarized in the points below, followed by a detailed summary of the discussion topics.

- Recreational anglers regularly utilize active, toppled-in-place, and reefed platforms for fishing.
- Standing platforms rather than toppled-in-place or reefed structures are preferred due to the higher diversity of species available throughout the full water column and, particularly for less experienced anglers, because they are easier to find and maneuver boats into position around than underwater features.
- In some areas, such as near Alabama, there is very high demand for easily accessible fishing spots. Anglers in private boats are increasingly fishing further from shore due to better engine technology and decreasing numbers of active platforms close to shore.

3.3.1.1 Factors Affecting Choice of Fishing Location

Informants explained that the exact locations preferred for fishing vary in depth and distance from shore across the Gulf. Anglers fish where the species they want are available and at locations that are more economical (i.e., usually closer to shore). They noted platforms that are closer to shore require less fuel and do not necessitate large, expensive boats to access, so they are more popular with a wider range of anglers.

The two informants familiar with the area off the coast of Alabama indicated there are platforms within 16.1 km (10 mi) from shore, but none between 16.1 and 56.3 km (10 and 35 mi) offshore, which limits the availability of readily accessible recreational fishing sites. However, they also noted there is an increasing willingness and ability to travel further offshore in smaller vessels due to increased capacity and affordability of engines for small boats.

One Alabama-based informant indicated that in this area, most anglers are willing to go up to 48.3 or perhaps 64.4 km (30 or perhaps 40 mi) offshore to specific fishing locations. They indicated locations such as Sabine, TX, require recreational anglers to travel further offshore into deeper waters to reach targeted species, whereas anglers out of Venice, LA, do not need to travel as far to reach targeted species. The informant also noted larger vessels with the ability to go 160.9 to 193.1 km (100 to 120 mi) offshore still visit platforms closer to shore to gather bait and fish for pelagic species further offshore.

Only one informant provided location-specific input, which is reflected in **Figure 3-11**. Several of the informants indicated that enforcement of state and Federal fishing regulations also influences how and when people fish.

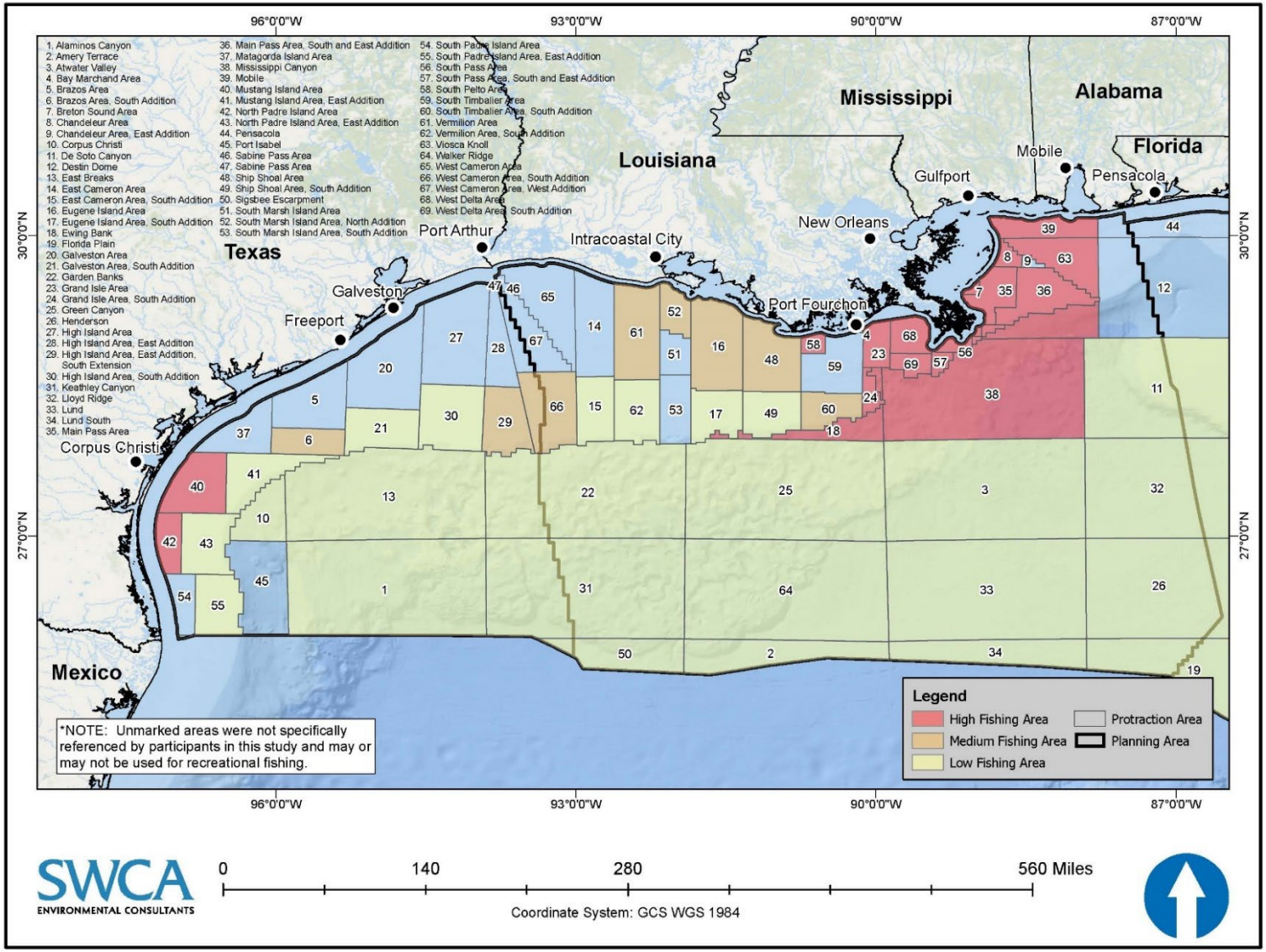

Figure 3-11. Areas identified by one key informant as active recreational fishing zones (n = 1)
Red = High fishing intensity, Orange = Medium fishing intensity, Yellow = low fishing intensity.

3.3.1.2 Fish Species Sought at Platforms

Informants indicated that desirable fish species around platforms typically include red snapper, sheepshead, gray snapper, red drum, amberjack, tuna, billfish, and cobia. Although other species (e.g., grouper, wahoo, dolphin) are known to be targeted, the informants did not specifically name these species.

3.3.1.3 Value for Fishing and Challenges of Maintaining Standing Platforms

The informants indicated that standing platforms are valuable as their shade and structure throughout the water column create a unique habitat. They explained once a platform is reefed, there is less growth and a loss of the shading effect, which reduces availability of target fish species. Informants noted that standing platforms are also valuable to anglers, especially beginners, because they are visually easier to find and retain position alongside than underwater features such as small, reefed structures. Several informants indicated that they would like to see some platforms remain standing after they are decommissioned to continue to provide this unique habitat and fishing value.

In response to the suggestion that some platforms be maintained standing after decommissioning, the informant from BSEE indicated that BSEE is aware that structures with portions that are above the water surface provide greater diversity of habitat. However, safe decommissioning and removal have been prioritized due to challenges associated with maintaining standing structures in the water in perpetuity. A solution for covering long-term maintenance costs is needed because unmaintained platforms degrade rapidly in the air-water interface.

3.3.1.4 Value and Management of Artificial Reefs

Comments from several informants indicated that there are a variety of fish associated with artificial reefs and that reefs are of value to recreational anglers due to the ecosystems they support. Alabama-based informants noted that areas offshore of Alabama do not have numerous platforms that would be eligible or good candidates for a Rigs-to-Reefs project due to the water depth limitation and permitting, which makes those platforms that are available for Rigs-to-Reefs projects very valuable.

However, one informant noted there are some data gaps regarding recreational uses of Rigs-to-Reefs projects and artificial reefs in general. Another informant noted decommissioned platforms that are not properly reefed (e.g., cut off too close to the water surface or placed in water that is too shallow or near other hazards) can pose risks to vessels navigating in the area.

Aside from recreational fishing, one informant indicated that artificial reefs provide opportunities to conduct environmental studies and noted they were aware that Texas A&M has been involved in studying these structures.

3.3.1.5 Changes and Trends

The Alabama-based non-profit informant indicated that fish aggregating devices (FADs) are sometimes deployed on the remains of decommissioned platforms and have proven valuable to anglers (see **Figure 3-12**). FADs are floating objects that are designed and strategically placed to attract pelagic fish. They explained the addition of a FAD reconnects the structure to a greater portion of the water column, shifting the platform legs from a bottom-fishing habitat to a full pelagic and bottom fish habitat, with associated diversity of species. The informant noted that with FADs, there is less material in the water than a standing platform, but they still provide the full vertical cross section of water depths. Informants noted that FADs typically are illegal and often are disposed of haphazardly, except off the coast of Florida, where some have been permitted and are legal.

Several informants indicated that increasing affordability and access to technologies such as GPS and fish finders have made good fishing spots more accessible to everyone. Changes in engine technology and associated costs for that technology over the last few years enable smaller vessels to access areas further offshore, where previously only very expensive, larger vessels with multiple engines could go. They indicated this is increasing fishing pressure and demand for fishing locations further offshore, particularly off the coast of Mississippi and Alabama.

Figure 3-12. Example of fish aggregating device (FAD)

One other trend the BSEE informant noted was that they are seeing increased security around active platforms, and that workers are not allowed to fish from platforms anymore.

3.3.2 Charter Fishing

Individual follow-up conversations were held with two charter fishing captains with multiple decades of experience based out of eastern Texas and Alabama. Key takeaways from these discussions are summarized in the points below, followed by a detailed summary of the discussion topics.

- Charter fishing operations regularly utilize active, toppled-in-place, and reefed platforms for fishing. In some areas, there can be 50 boats fishing alongside a platform, with numbers increasing to around 150 boats for tournaments.
- Active platforms that extend through the whole water column are preferred over toppled-in-place or reefed structures due to the higher diversity of species available.
- In some areas, such as near Alabama, use of active platforms further offshore is increasing due to increasing numbers of private boats that can reach offshore destinations and low/decreasing numbers of active platforms available nearer to shore.
- Platforms are useful for fishing, but charter fishing informants are also concerned about the potential negative effects that these structures could have on ecosystems over the long term, such as increased fishing pressure that may be generated by aggregating fish to these structures, the implications for the long-term viability of the fisheries, and increased spread of invasive marine species.

3.3.2.1 Fishing Locations

The Alabama-based charter fishing captain reported that, to his knowledge, charter fishing takes place at platforms in shallow waters off Mobile Bay, as these areas are where small reef fish and pelagic fish such as mackerel congregate. Farther from shore, between 96.6 and 241.4 km (60 and 150 mi) from ports in Alabama and Louisiana, where active deep-water platforms are located, there tends to be more variety of game fish such as wahoo, tuna, barracuda, shark, marlin, and dorado.

The Texas-based charter fishing captain informant reported that, to their knowledge, in the upper Texas coast (Bay City to the Louisiana border), there is a high concentration of active platforms used for charter fishing. Moving east from Louisiana to Mississippi and Alabama, fishing intensity increases. Along the southwest corner of the Gulf just north of the Texas and Mexico border, there is much illegal fishing taking place out of Mexico. They noted that west of the Ship Shoal Block area to about the West Cameron area off Louisiana, there is almost no charter fishing happening despite appropriate habitat and fish. The informant indicated this is due to lack of access to infrastructure such as ports or good lodging along this area of coast. They also noted there is little to no charter fishing effort out of Cameron, LA, and little fishing effort out of area between Sabine Pass, TX, and Marsh Island, LA.

Both informants confirmed that some charter boats also come from Florida to fish deep-water platforms in the western GOA.

A third charter fishing captain provided information via email about areas where they are aware charter fishing takes place. All location input received from the three informants is reflected in **Figure 3-13**; additional locations may be utilized beyond what was discussed and shown in this figure.

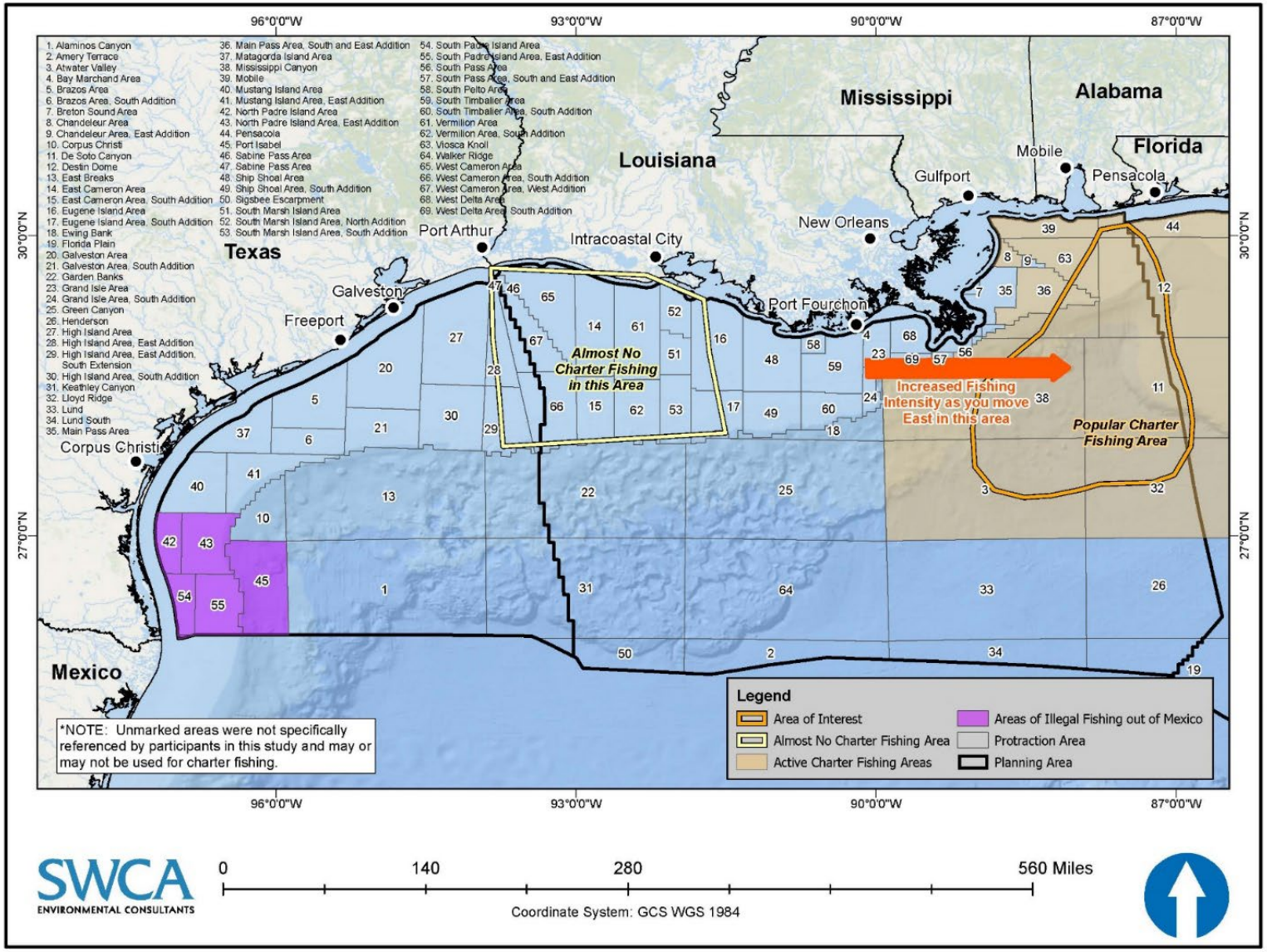

Figure 3-13. Areas identified by experienced charter fishing captains as active charter fishing zones (n = 3)
Orange = Active charter fishing areas; Purple = Areas with illegal fishing; Orange outlines = Areas of interest for charter fishing; Yellow outlines = Areas with little charter fishing activity.

3.3.2.2 Factors Influencing Choice of Route or Destination

The charter fishing captains based in Alabama and Texas (hereafter referred to as the two charter captains or informants) indicated that ocean currents, weather, wind, fishing pressure, distance from port, and fuel cost are all factors that influence fishing destinations and routes.

The Alabama-based charter captain noted that offshore fishing in the Gulf includes both charter businesses that are taking customers out to sea for a fishing experience and increasing numbers of wealthy private individuals fishing on large (e.g., center-console) boats. For example, one informant stipulated that in Orange Beach, AL, there was "$300 million worth of private boats" participating in fishing tournaments and fishing primarily around active deep-water platforms. However, for many charter fishing operations, these expensive long-range boats, often costing as much as $800,000, are not cost-effective for charter fishing economics.

Both charter fishing captains indicated that in some areas, due to the removal of decommissioned platforms closer to shore, boats are forced to go to more distant locations and use more fuel. Where previously boats traveled only 32.2 to 48.3 km (20 to 30 mi) offshore to fish at platforms, there are now few platforms within 64.4 km (40 mi) from shore. Therefore, charter operations are shifting to fish more natural bottom habitat close to shore or are traveling further from shore to reach platforms. The Alabama-based informant indicated that some charter boats leaving from Alabama now provide 24- to 48-hour trips that go as far as 321.9 km (200 mi) from their home port.

3.3.2.3 Sources of Information Used to Identify Charter Fishing Routes and Destinations

The two charter captain informants indicated that informal information swapping among charter boat captains, use of sonar, and locations of rips and tidelines can help identify promising fishing destinations. Tom Hilton's Offshore Maps (Hilton's Fishing Charters LLC 2021) is one source charter boat captains use to help identify areas of blue water, which defines preferable areas. CMOR Mapping (CMOR Mapping 2021) is another data source and displays bathymetric imagery usable by the average angler to find locations that were once more exclusive.

One charter fishing captain indicated they have been involved in a forthcoming program expected from NOAA Fisheries that will provide logbook and VMS data for every charter boat in the GOA. As an update, at the time of this report, the United States Court of Appeals for the Fifth Circuit set aside the final rule implementing the Southeast For-Hire Integrated Electronic Reporting Program in the GOA.

3.3.2.4 Fishing Methods

According to the two charter fishing captain informants, trolling with artificial lures is the most common method of fishing used by charter fishing operations. They indicated some tournaments allow live bait to be used as well. Technology has made it much easier to identify which platforms are the most fruitful in terms of fish congregations, as sonar typically is used to identify fish around platforms.

3.3.2.5 Platform Structure Type

The two charter captain informants indicated platforms that provide substrate vertically throughout the water column are best for charter fishing due the increased diversity of fish they attract as opposed to other reefing methods. They noted reefed and toppled-in-place platforms attract more reef fish such as snapper, grouper, and amberjack; standing platforms also attract pelagic species and provide good habitat for juvenile fish, leading to higher recruitment.

Both charter captain informants preferred to see platforms left in the water whenever possible. The Alabama-based informant noted there is great demand for platforms and artificial reefs off the coast of Alabama and indicated more structures in this area would be beneficial for fishing. However, the Texas-based charter captain, who has 35 years of experience fishing in the region, explained that a reefed vessel (The Kraken) that serves as a popular fishing and diving destination was sited in an area with significant existing hardbottom habitat. The two captains noted fishing around the structure was very good for the first couple of years, as fish in the surrounding habitat were drawn to the reefed structure. The two captains observed that fishing numbers at the structure and in the surrounding habitat have subsequently declined, presumably due to the increased fishing pressure facilitated by the aggregating effects of the structure. This informant suggested that siting reefed structures in soft bottom areas that have little existing habitat might better support fish populations than siting structures in areas where hardbottom habitat is already present. Otherwise, the reefed structure may increase fishing success temporarily, but ultimately deplete the fish population. According to this informant, artificial reefs are only beneficial if properly sited in muddy bottom areas to create new habitat. The informant noted that other siting factors such as proximity to shipping lanes or cost of transporting structures to new locations often take precedence over selecting the best site for habitat creation.

The Alabama-based informant was dubious about the value of alternatives to platforms such as FADs, which are floating objects designed and strategically placed to attract pelagic fish (NOAA Fisheries 2021b). The two captains indicated FADs have less structure than platforms and do not provide the same amount of habitat or hiding places for juvenile fish. Additionally, they expressed concern that informal creation of FADs has generated marine debris.

3.3.2.6 Long-Term Tradeoffs Related to Platform Presence

Although both charter captain informants confirmed that platforms are generally beneficial for fishing, they also noted two key concerns about the long-term effects of having platforms and reefed structures in the Gulf.

The first concern was the aforementioned impact on fish populations due to increased fishing pressure. These structures aggregate and make it easier to access fish (i.e., catch per unit effort presumably goes up in areas with platforms or reefed structures). Informants observed that prior to the proliferation of platforms, fish were more dispersed throughout the Gulf; they expressed concern that, if not properly managed, intense fishing around platforms could ultimately deplete key fisheries in the region. One informant noted that states may be disinclined to restrict fishing because of the revenue they receive from fishing licenses. One informant stated that "if there were no oil rigs out there, people would be reef fishing and trolling like they did years ago for marlin." The second concern was that platforms and associated pipeline structures were facilitating increased spread of invasive species like lionfish and invasive coral.

3.3.3 Diving (Including Spearfishing)

A small group discussion was held with six key informants with knowledge of diving, including an experienced individual diver based in Texas, a Louisiana-based diver, an executive director of a non-profit focused on offshore reef research, a diver and co-president of an ocean conservation non-profit focused on the GOA, and three owners and staff of two diving trip operators based out of Texas. Key takeaways from the discussion are summarized in the points below, followed by a detailed summary of the discussion topics.

- Divers regularly utilize standing, toppled-in-place, and reefed platforms for both recreational diving and spearfishing.

- Surface access, easy mooring, appropriate water depth, availability of adequate horizontal space, and distance from shore are key factors that make a site preferable to divers.
- Divers are very concerned about perceived dramatic loss in platforms suitable for diving as more platforms are removed from the Gulf and about the potential long-term impacts to fish populations from perceived increased fishing pressure around artificial reefs.

3.3.3.1 Preferred Platform Characteristics for Recreational Diving

3.3.3.1.1 Appropriate Water Depth

Informants agreed most divers can dive to a depth of 15.2 to 30.5 m (50 to 100 ft), while the ideal depths for spearfishing can reach 61.0 to 91.4 m (200 to 300 ft) in terms of access to fish size and species. Platforms that are reefed on their side in 12.2 to 24.4 m (40 to 80 ft) of water, with the maximum being 30.5 m (100 ft), are ideal for non-technical and no decompression diving.

Dive trip operators indicated platforms that are cut off at depths of 21.3 to 24.4 m (70 to 80 ft) below the water surface are generally unsuitable for recreational diving. By example, one informant indicated the High Island 398 platform was a highly ranked dive site until it was cut off at 21.3 m (70 ft) below the water surface and the upper portions moved elsewhere. They indicated the remaining platform legs are now "a ghost town, unfit for any diving use" due to the reduced habitat and surface access for divers. An informant also noted that if a platform is cut off within the "murk layer," the location of which varies seasonally based on water runoff and the outflow of rivers, then it is useless for diving, as this layer also diminishes the quality of the reef. Several informants indicated it would be ideal for diving if more platforms could be cut off above the murk layer, around 12.2 to 18.3 m (40 to 60 ft) below the surface.

Informants indicated the U.S. Coast Guard has implemented a minimum 24.4-m (80-ft) cutoff to prevent negative interactions between transiting vessels and remaining structures. Some informants see this depth cutoff as an arbitrary depth that unnecessarily limits diving and spearfishing opportunities and would like to see this policy reconsidered. Other informants noted the draft depth of very large crude carriers and ultra-large crude carriers can be 24.4 m (80 ft) or more, which may drive the cutoff depth of platforms. If shorter cutoff depths pose risks to very large crude carriers and ultra-large crude carriers, some informants indicated they would only need a few platforms above the 24.4-m (80-ft) cutoff for diving and fishing. Several informants indicated they are concerned there will eventually be no platforms remaining that are suitable for diving as more and more are removed using the currently prevalent decommissioning practices.

3.3.3.1.2 Surface Connection for Access, Protection, and Mooring

Informants shared that standing platforms are best for diving; active platforms can be especially good diving locations. Dive trip operators noted ocean currents are often unpredictable and strong, so it is helpful to have structures in the water that divers can hold onto or hide behind for increased safety. For platforms that are cut off below the water surface, divers indicated they prefer them to be as close to the surface as possible. Divers indicated they appreciate having mooring balls or submerged moorings attached to structures to reduce the time required to moor the boat at the site.

3.3.3.1.3 Horizontal Space

Dive trip operators indicated that platforms toppled-in-place at accessible depths are valuable for diving because they provide more horizontal area where divers can spread out because dive boats may drop anywhere from 20 to 30 divers at a time.

3.3.3.1.4 Closer to Shore

Divers indicated they prefer platforms that are closer to shore. However, there were only a few good diving locations within 48.3 to 64.4 km (30 to 40 mi) from shore in the areas the six informants identified as active diving zones (**Figure 3-14**). It is recognized that additional locations are utilized beyond what is shown, but they were not disclosed, discussed, or identified by these particular informants.

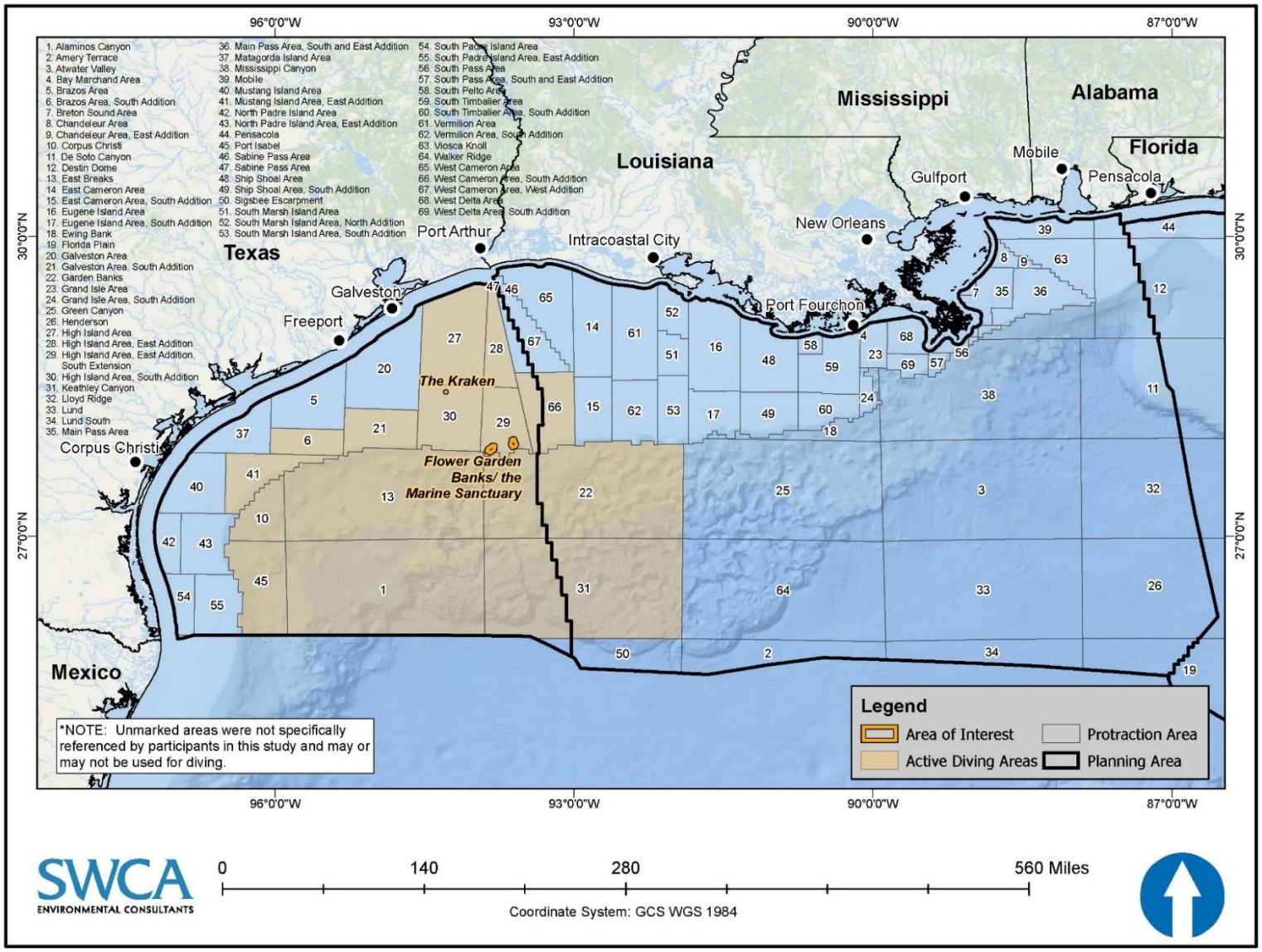

Figure 3-14. Areas identified by six divers and dive trip operators as zones frequented by divers (n = 6)
Orange = Active diving areas; Orange outlines = Areas of interest for diving.

3.3.3.2 Timing of Diving Activity

Informants indicated the dive season generally consists of three different time periods, with weather being the largest driver of seasonal operations:

- Pre-season (weekends only) runs from Mid-February to Memorial Day.
- Regular season (7 days per week) runs from Memorial Day to Labor Day.
- Post-season runs from Labor Day to Halloween.

3.3.3.3 Ecological Value and Conservation Concerns

One informant indicated that there was concern within the diving community that if platforms regularly utilized for fishing are reefed, there is the potential of over-exploitation by recreational anglers, negatively impacting platform habitats, similar to observations mentioned by charter fishing captains. The diving informant indicated that recreational fishing groups have expressed their willingness to accept restrictions on fishing that would protect the productive capacity of artificial reefs, especially for overfished species. The informant suggested that if platforms are reefed properly, with effective management, habitats could retain their ecological value while providing a resource for recreational fishing and diving stakeholders. In support of this perception, another informant indicated they have seen studies that show platforms are very productive from a fisheries perspective. They also noted Flower Garden Banks National Marine Sanctuary, which is located approximately 185 km (115 mi) offshore from Galveston, TX, and other platforms that corals inhabit are productive and being used for coral restoration projects, specifically Moody Gardens in Galveston, which has a coral restoration lab.

Several informants expressed disappointment that platforms are being removed and cut off as the vertical structure of platforms throughout the water column provides habitat for a variety of species. An informant indicated that, "due to the outflow of the Mississippi River, the sea bottom of the GOM, except for Flower Garden Banks, is a desert. The offshore platforms provide habitat, ecosystems, and ecosystem services in which the sea bottom is lacking. If the platforms are removed, the GOM reverts to a desert."

3.3.3.4 Concerns Regarding BOEM Implementation of Policies, BOEM Mission Statement, and Scope of Study

One informant noted that under the Energy Policy Act of 2005 (U.S. Environmental Protection Agency 2022), Congress directed the Department of the Interior to consider other marine uses of oil and gas platforms. Additionally, the informant expressed concern that the Minerals Management Service (now BOEM) has established regulations (30 Code of Federal Regulations 585) that instruct applicants on how to use the platforms after they are no longer producing oil and gas and before they are removed, which the informant did not see recognized in BOEM's mission statement or this discussion.

The informant expressed concern that although there are regulations regarding where platforms can be re-permitted, BOEM denied permits for North Padre Island and West Cameron platforms that were perceived to be ideal for diving and fishing. They also shared a concern that this study is not considering how platforms are used for scientific research or education in addition to recreation.

3.3.4 Pelagic Birding

A Small Group Discussion was held with five key informants with pelagic birding experience including three Texas-based pelagic birders and two birders from Louisiana who also represent bird conservation non-profit organizations. Key takeaways from the discussion are summarized in the points below, followed by a detailed summary of the discussion topics.

- Sites where pelagic birds can be found in the Gulf are very unpredictable and pelagic birds do not reliably appear on or around platforms. Birds on nearshore platforms tend to be terrestrial bird species. Platforms in deep water farther from shore are more likely to attract migratory terrestrial birds using them as resting places than pelagic species.
- Birders will check platforms that they pass in case pelagic birds happen to be there.
- Birding trips typically target floating sargassum, shrimping boats, and underwater structures like salt domes as these sites are most likely to attract pelagic birds seeking the prey brought to the surface by these features.

3.3.4.1 Preferred Birding Sites

Birders indicated they do not consistently observe pelagic birds around platforms. Pelagic birder informants indicated they typically target underwater geologic features and areas where the continental slope is the steepest off the continental shelf edge. They reported they also seek out blue water, rip lines of sargassum that have bait fish and crabs that birds can feed on, and the GOA Loop Current,[3] because these features attract a wider bird species diversity. However, they noted certain bird species prefer brown, blue, or green water and along the Mississippi coast; the distance and location of blue water changes depending on the plume of the Mississippi River and delta. Informants noted that when outside of the continental shelf, shrimp boats are often a significant attraction, especially when they are anchored throughout the day, culling their catch, and discarding bycatch that is a food source for pelagic birds.

Louisiana-based birding informants noted that the Mississippi Canyon (an undersea canyon in the north-central Gulf, south of Louisiana) is frequented by birders in the area and experiences significant fishing pressure. In this area, both the extensive ocean bottom geologic features and GOA Loop Current (which can introduce sargassum to the area) attract prey items and, consequently, birds.

Texas-based birding informants indicated that along the south Texas coast, oceanic features that are of interest to birders include salt and quartz domes and Camel's Head, a seafloor geologic feature that resembles a camel's head. One informant noted that they had observed birds around toppled platforms on the continental shelf between 40.2 and 321.9 km (25 and 200 mi) offshore in about 91.0 to 91.4 m (200 to 300 ft) of water, and that might concentrate prey items that could attract pelagic birds. It was not clearly explained exactly which bird species had been observed at these locations.

Informants familiar with the area near Port Aransas, TX, noted platforms in this area are within the range of most birding boats but are also situated on the continental shelf in shallow water and, therefore, are primarily populated by terrestrial bird species. Birders indicated they do not frequent platforms off the lower coast of Texas and Port Aransas for pelagic birding because platforms serve as resting places for common coastal bird species easily found on land. Occasionally, and under the right weather circumstances, migratory birds may also use the platforms as resting places. All location input received from the five informants is reflected in **Figure 3-15**. Though additional locations may be utilized beyond what is shown, they were not disclosed, discussed, or identified by the informants.

[3] The Loop Current is an area of warm water that travels up from the Caribbean, past the Yucatan Peninsula, into the Gulf, through the Florida Straight, into the Gulf Stream, and then north up the eastern coast of the United States. The Loop Current is variable, sometimes barely entering the Gulf before heading north up the eastern coast of the United States. Sometimes, it can travel to the coast of Louisiana before flowing south towards the Florida Straight (NOAA 2021a).

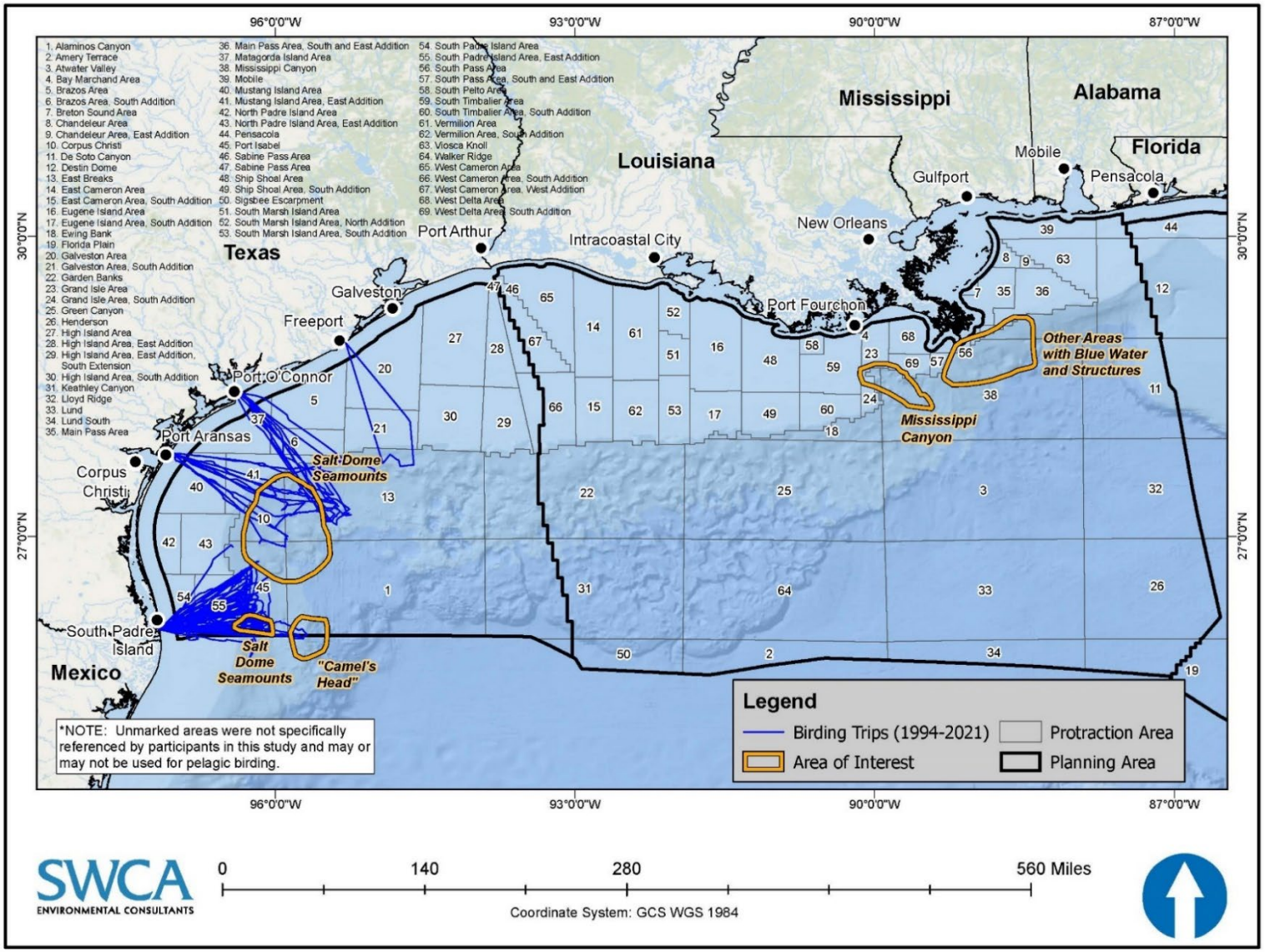

Figure 3-15. Areas identified by Texas and Louisiana-based pelagic birders as pelagic birding zones (n = 5)
Blue lines = Pelagic birding trip tracks recorded over the period 1994–2021, Orange outlines = Areas of interest for pelagic birding.

3.3.4.2 Typical Depth, Distance, and Duration of Birding Trips

Pelagic birders indicated that they typically do not travel more than 128.8 to 160.9 km (80 to 100 mi) from shore. Most pelagic bird species prefer water that is 182.8 to 304.8 m (600 to 1,000 ft) deep (sometimes greater), which requires boats that can navigate past the continental shelf edge.

One Texas-based birding informant noted that the distance required in crossing the continental shelf influences the length of birding trips. The informant noted maximum day trip distances are typically 128.8 to 144.8 km (80 to 90 mi) out to sea, requiring at least 12 hours. These 12 hours consist of 4 hours in mostly unproductive (for bird sighting) continental shelf water, 4 hours beyond the continental shelf edge which yields sightings of pelagic birds, and 4 hours back to shore. Common ports such as South Padre and Corpus Christi are 64.4 to 80.5 km (40 to 50 mi) to the continental shelf edge, respectively. Birding trips from these locations can be done in 1 day. Galveston, however, is 160.9 km (100 mi) from the continental shelf edge and requires an overnight trip. The time and expense necessary for a pelagic birding trip into the Gulf is high, and there is no guarantee of seeing pelagic birds. There are sometimes incidental views of pelagic birds on platforms, but their presence is unpredictable.

Texas-based pelagic birders indicated that along the Texas coast, from South Padre Island to Corpus Christi, most platforms are on the continental shelf in shallow water, with only a few platforms in deep water. They indicated birders seeking marine bird species are typically interested in traveling out past the continental shelf, which would be between 72.4 to 160.9 km (45 and 100 mi) offshore, due to the availability of bird species. Birders do not usually visit deep-water platforms because they are located more than 160.9 km (100 mi) from shore. One Texas-based informant indicated there are plans for some birding expeditions to target deep-water locations in the future.

3.3.4.3 Bird Species Sought

Pelagic birders indicated the pelagic birds of interest include shearwaters, petrels, tropicbirds, pelagic terns, storm petrels, masked boobies, brown boobies, brown noddies, magnificent frigatebirds, bridled terns, and jaegers. One informant noted sooty terns can be viewed on the islands of Laguna Madre, TX, where they nest and then spend the rest of their lives in the deep waters of the Gulf.

3.3.4.4 Marine Species Associated with Fruitful Birding Locations

Pelagic birders indicated bait fish, whale sharks, dolphins, sperm whales, and other cetaceans attract some bird species of interest to birders. They also indicated pelagic birders are interested in following tuna schools as they attract pelagic terns and storms petrels, among other species, but this often requires multi-day and multi-night trips. They noted that, with luck, tuna schools can be located on 12- to 16-hour day trips. They noted that pelagic birds have been observed around platforms when tuna fishing is taking place around the platforms at night.

3.3.5 Shared Management Concerns and Recommendations Noted by Informants

3.3.5.1 Preserving Structures in the Water for Ecological and Recreational Benefit

Informants across all recreation types expressed interest and support for retaining platform structures in the water, where they can continue to support marine ecosystems and provide habitat for a wide range of species. All recreation types examined in this study except pelagic birding rely heavily on platforms and reefed structures for meaningful recreation, and informants expressed concern regarding potential reductions in the number of platforms available for recreators in the future.

While recognizing the potential safety issues and maintenance costs associated with retaining standing platform structures after they are no longer in operation, many informants expressed a desire that at least some platforms be retained standing to provide habitat throughout the water column.

3.3.5.2 Maintaining Sustainable Fisheries in the Gulf

Informants across charter fishing, diving, and recreational fishing all expressed concern about the long-term viability of fisheries in the Gulf. Charter fishing informants seemed to have thought most deeply about this. In addition to gathering more information about how artificial structures such as platforms and pipelines affect fishing dynamics, fish populations, and the island biogeography of patchy habitat in the Gulf, informants pointed out the following issues and recommendations related to maintaining sustainable fisheries:

- Aggregation and potential subsequent overfishing are important to consider when siting artificial reefs
- Fishing around reefed structures may need to be actively managed in coordination with states

3.3.6 Questions from Informants for Further Exploration and Study

The literature review and data review tasks indicated variable and generally lacking spatially explicit information on recreational uses of platforms in the GOA. These findings confirmed the need to conduct local public outreach to stakeholders, starting with the exploratory discussions summarized here. Based on information provided by key informants in combination with the information available in existing literature and data review, the following represent data gaps or areas where further study may be warranted to achieve BOEM's goal of understanding this resource better, obtaining reliable data, and identifying promising strategies for management of platforms and recreation in the Gulf.

3.3.6.1 Understanding Recreation

- What is the full geographic extent of recreational uses of platforms in the Gulf? This study provides some initial information based on discussion with a small number of key informants, but not a comprehensive assessment.
- To what extent and in what ways does the presence of man-made structures such as platforms and artificial reefs affect fishing effort?
- Is the presence of man-made structures such as platforms and artificial reefs contributing to overfishing?

3.3.6.2 Understanding How Structures Affect the Ecosystem

- Are platforms and artificial reefs increasing overall fish numbers or just aggregating fish that are already there?
- How does the presence of pipelines influence the connectivity between isolated habitat patches in the Gulf, and what are the implications for aggregation and overfishing dynamics or repopulation of depopulated sites?
- Are platforms and pipelines contributing to the spread of invasive species?

3.3.7 Recreation-specific Ideas and Opportunities from Informants

Informants shared for BOEM's consideration the following specific ideas and opportunities that could support recreation and beneficial management of platforms.

3.3.7.1 Revise the 80-foot Cutoff Depth for Platforms

Divers expressed a strong preference for cutting off at least some platforms depths less than 24.4 m (80 ft) (the current standard) to facilitate use by divers. Informants were not sure whether the current 24.4-m (80-ft) standard is intended to protect ships from collision with the structures. They expressed support for a change to the standard to allow platforms to be cut off at 12.2 to 18.3 m (40 to 60 ft) below the surface, at least in some areas accessible to divers.

3.3.7.2 Formal Deployment of Fish Aggregating Devices (FADs)

An informant noted that FADs have been deployed informally by fishers in many places in the Gulf. Informants noted the effectiveness of these FADs is unclear and informal FADs are often poorly constructed or disposed of improperly, creating marine debris. However, there was interest among a few informants in whether a formal FAD deployment program like the one currently underway in Florida might provide supplemental habitat to replace platforms removed from the Gulf.

3.3.7.3 Turn Platforms into Pelagic Bird Nesting Islands

Pelagic birding informants suggested that deep-water platforms could potentially be modified to create offshore nesting sites for tropical pelagic species. Informants suggested that platforms repurposed in this way would need to be in blue water with a viable food source nearby. They noted that birds using such artificial islands would impact the ecosystem in many ways; for example, bird droppings would add energy to the water, possibly benefiting the food chain. A suggested method to create a nesting island was to strip a platform in an appropriate location and weld a containment around it that would then be filled with sand. Informants suggested leveraging partnerships with companies that operate the platforms to decommission them in this conservation-positive manner.

3.3.7.4 Outfit Platforms to Support Education and Ecotourism

Informants indicated there are also associated efforts in partnership with aquariums along the Gulf Coast to provide real-time video and audio broadcasts from the platforms to the aquariums. These real-time features allow visitors to see the undersea life, divers, fishers, and people in submarines.

4 Analysis of Approaches for Future Data Gathering of the Recreational Uses of Platforms

Despite the availability of relevant literature, readily available GIS databases, and information gleaned from recreational user groups, the findings of this study revealed that there is a general lack of recent spatially explicit information on the recreational use of offshore platforms in Federal waters of the GOA. To assist with addressing this data gap, a preliminary assessment of approaches was conducted to come up with methodologies that BOEM could employ to obtain spatial data that directly assesses the recreational uses of oil and gas platforms.

This section discusses the assessment of future approaches for data gathering was developed using information from the literature and geospatial data searches, augmented with internet searches and grouped into the following categories:

- Existing Recreational Fishing and Diving Surveys
- Mobile Phone Applications
- Web-based Portals and Dashboards
- Vessel Monitoring Systems

- Satellite Surveillance
- Acoustic Recorders
- Fixed Camera Surveillance
- Data Mining of Social Media Sites

4.1 Existing Data Collection Methods and Potential Modifications to Inform Recreational Use

4.1.1 Surveys

4.1.1.1 Angler Surveys

NOAA Fisheries' MRIP is the Federal program designed to gather data and information on recreational fishing in U.S. coastal waters including the GOA (**Section 2.2.2**). However, at present, the MRIP does not gather exact geographic information of fishing locations. Taken together, the MRIP components form the core of the available, quantitative information, albeit generally lacking in platform-specific utilization data. Limitations to utilization of these data may occur due to the proprietary nature of commercial fishing data under NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

The MRIP or state surveys using questionnaires could be the easiest way to gather information on use of oil and gas platform by recreational anglers by asking for location or platform use information. Mail or telephone surveys could be modified simply by adding questions regarding the use of oil and gas platforms during a fishing trip. Beyond asking for exact locations of platforms used, other information—such as water depth, distance from shore, and number of legs (or some measure of platform size)—would also provide sufficient information on locations, assuming participants would be willing to divulge their favored locations. This information would provide data on the relative use of platforms by participating anglers without engaging in issues related to smartphone technology discussed below in **Section 4.1.2**.

4.1.1.2 Diver Surveys

There are no known ongoing organized data collection efforts focused on diving activity in the GOA. Individual studies of recreational diving have been conducted using acoustic recorders (Simard et al. 2016) and questionnaires (Ditton et al. 2002). Dive trip operators are also an important source of information about diving activity, as many recreational divers primarily dive as part of organized dive trips; individual or non-group diving is rarely practiced due to the expenses of owning gear and a vessel, and for safety reasons. Dive data are also collected by individual divers via mobile dive logging apps. Dive and fishing charter trips typically operate separately because they have inherent operational conflicts. For any dive survey program to provide meaningful data regarding diving activities, the contact list for this survey would likely need to be expanded to include adequate representation of dive operators.

Because divers must be certified, and many dive as part of organized dive trips, divers may be easier to survey than other recreators that can operate more independently. Dive operators, diving instructors, those who have recently participated in organized dive trips, or divers seeking re-certification could all be appropriate individuals to survey. Canvassing of these diving participants could help identify independent divers who may be willing to provide platform utilization information. Survey efforts directed at dive operators, not unlike the efforts of port samplers for fishing estimates, may be the most effective means of understanding the magnitude and distribution of diving activity.

Divers contacted to participate in exploratory discussions for this study were very responsive and passionate about the future management of GOA diving locations. They provided detailed information about their site preferences and use of platforms. The success of the exploratory discussions suggests that additional focus groups composed of representative groups of experienced divers or dive trip operators would likely be successful in yielding additional details of diving activity patterns around platforms in specific locations of interest and throughout the GOA.

Written questionnaires have been used previously to survey divers and dive operators. For example, Stanley and Wilson (1989) used a mail-in survey distributed through sportfishing and diving groups and published in a sportfishing magazine to gather information from dive operators about boat characteristics, number of divers in their party, the lease blocks most frequently visited, most frequently used ports, average number of trips per year to oil and gas platforms, species of fish sought, and seasons with the highest levels of activity. Survey responses were used to calculate distances from frequently used ports to lease areas and oil and gas platforms.

Ditton et al. (2002) mailed 1,057 surveys to divers that had used charter dive boats in the preceding 12 months and received responses from 56% of divers contacted. Survey questions asked about overall sport diving activity and experience, saltwater scuba diving activity in Texas and elsewhere, (e.g., TPWD artificial reefs and the Flower Garden Banks National Marine Sanctuary), water depth preferences in the GOA, and motivations for diving. The survey also addressed attitudes toward the current TPWD reef system and material and structural preferences, as well as respondent age, gender, race, ethnicity, education, income, and residence location.

4.1.2 Angler Mobile Applications

Smartphone or mobile apps appear to be a promising way of gathering recreational fishing data, especially spatial data as most have built in GPS capabilities. However, user buy-in and participation may be a potential problem, as discussed by Stunz et al (2016). Users may not be motivated enough to use the app on all fishing trips and may even forget to use it if not prompted. Frustrations associated with operation of these apps may also dissuade users from engaging in a particular data collection program especially when offshore and out of service range without accommodation of off-line app capability. Nevertheless, for short-term events such as local fishing tournaments or the 10-day red snapper season when iSnapper was used (Stunz et al 2016), questions regarding platform use could easily be added to the existing set.

Apps such as iSnapper, Snapper Check, Tails n' Scales, LA Creel, Texas Coastal Creel Survey, and iAngler currently do not include request for fishing location, GPS tracking submittals, or questions relative to offshore platform use. However, if those were added, it would allow for analysis of overall scale, geographic extent, and site-specific determinants of recreational uses of offshore platforms.

4.1.2.1 iSnapper App—Sportfish Center, Harte Research Institute, Texas A&M University

iSnapper is a free smartphone app designed for private recreational anglers to log their catch and effort information during fishing trips (**Figure 4-1**). Data collected includes trip length, general fishing location, fishing depth, number of anglers, and number of fish (red snapper) released. Additional socioeconomic questions asked include average distance traveled, expenditures for bait and tackle, fuel consumed, and yearly household income. Because these data are self-reported, a subsample of iSnapper entries need to be validated against dockside intercept interviews. The iSnapper app was tested during the Federal 10-day Red Snapper season of 2015 (Stunz et al 2016). The iSnapper app does have an entry for general fishing location although as it currently exists, does not specify platform utilization.

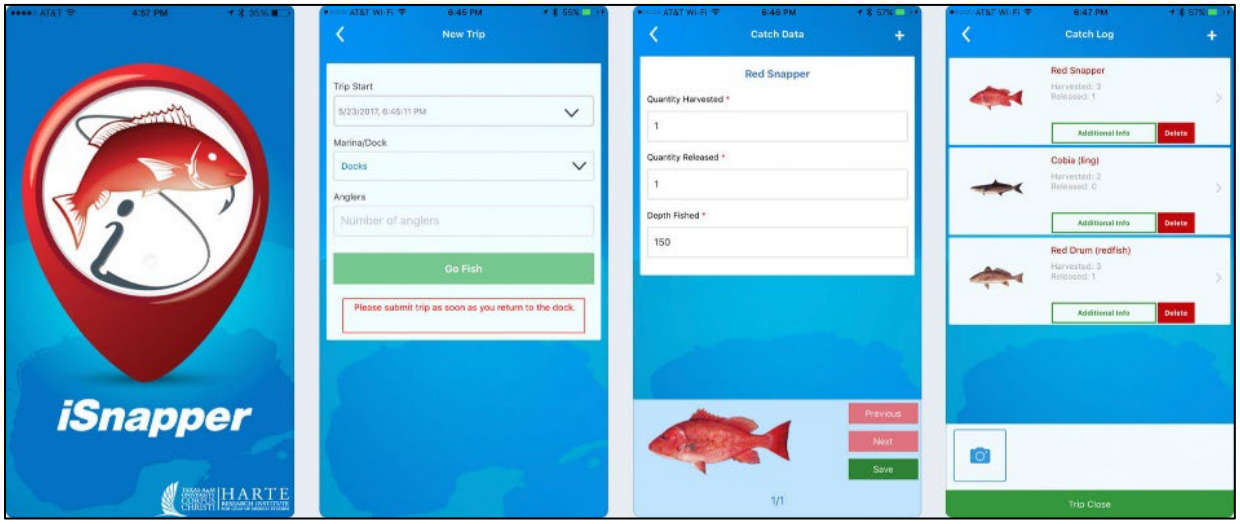

Figure 4-1. Screen capture from the iSnapper
Application developed by the Sportfish Center of the Harte Institute.

4.1.2.2 Snapper Check - Alabama

Red snapper landings in Alabama are monitored by use of mandatory smartphone app through Outdoor Alabama App and the Snapper Check program within the app (**Figure 4-2**). The survey uses a capture-recapture survey design (i.e., initial app-based reporting and subsequent dockside sampling) and has been certified by NOAA Fisheries' MRIP. One report per recreational fishing vessel trip includes trip information on the vessel type (powered, private, chartered) and vessel ID, county of landing, landing access type, and number of anglers harvest information for red snapper, grey triggerfish, and greater amberjack; the report does not include specific geographic fishing location information, which again hampers extraction of platform use information.

The data collected from these surveys supplement the general MRIP surveys in the state and provides semi-weekly landing updates during the fishing season. The Outdoor Alabama App includes information access to weather, field guides, best fishing times, and fishing regulations.

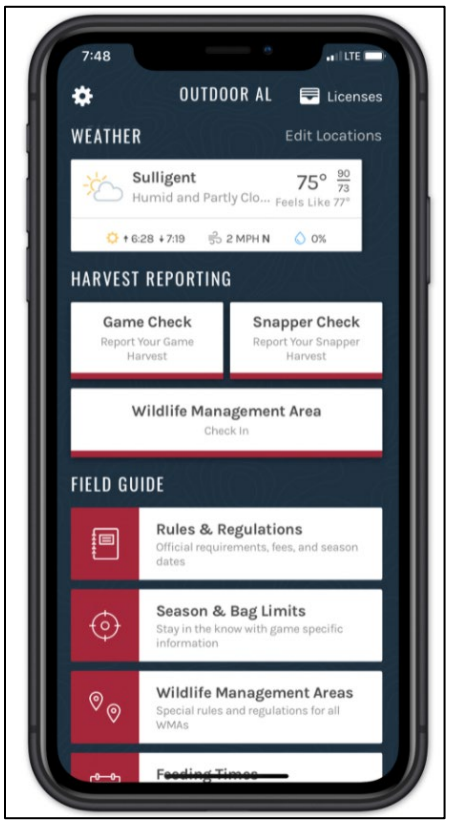

Figure 4-2. Screen capture of Outdoor Alabama App with Snapper Check as a selection

4.1.2.3 Tails n' Scales - Mississippi

Red snapper landings in Mississippi are monitored by use of mandatory smartphone app, Tails n' Scales (**Figure 4-3**). The survey uses a capture-recapture survey design (i.e., initial app-based reporting and subsequent dockside sampling) and has been certified by NOAA Fisheries' MRIP. The data collected supplement the general MRIP surveys in the state. If location technology is enabled (voluntarily) on the smartphone, current fishing location can be determined. The app includes a local weather link but has poor reviews due to website and account login issues.

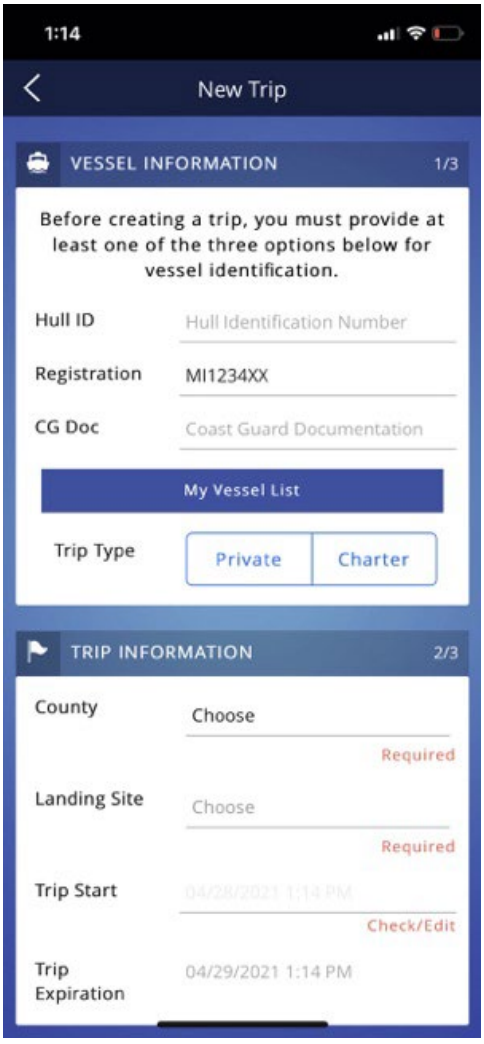

Figure 4-3. Screen capture of the Tails n' Scales app

4.1.2.4 iAngler - Angler Action Foundation

The Angler Action Foundation improves angler access, fisheries science, and marine habitat through collaborative research, education, and conservation programs. The Angler Action program aims to improve the fish habitat using a voluntary community-based approach to report catch logs (**Figure 4-4**). The Angler Action portal and apps provide a password protected method of recording trips as well as each fish. Angler Action is a service project of the Snook & Gamefish Foundation, undertaken in partnership with Florida Fish and Wildlife Conservation Commission, University of Florida researchers, and other partners. The iAngler Partnership Program is the only available platform that allows recreational anglers to participate directly in fishery management and functional habitat mapping at local, state, and Federal levels. Additional iAngler Apps include a simplified iAngler Lite, one for tournaments, charter trips, and Gulf red snappers.

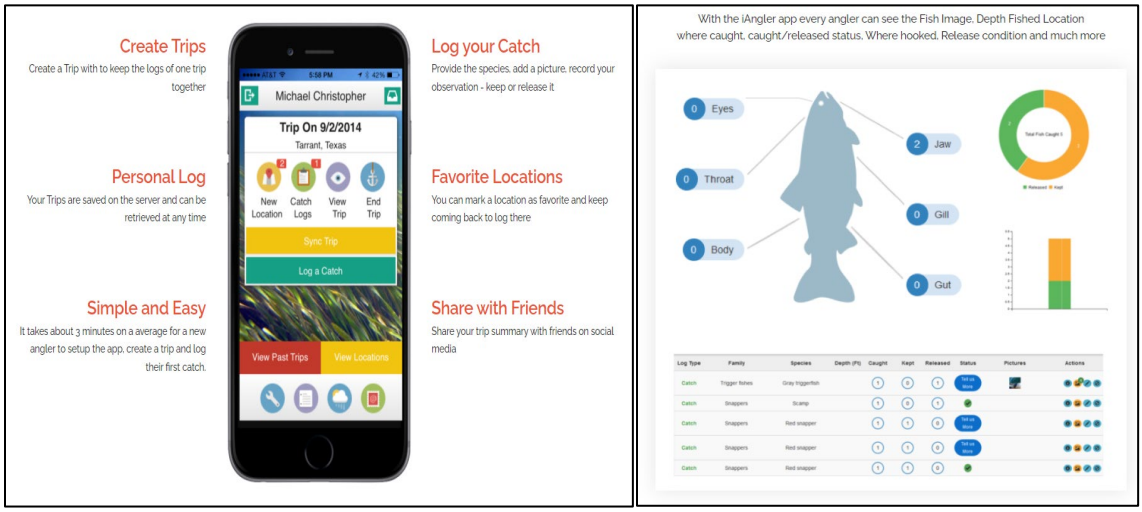

Figure 4-4. Screen captures of iAngler Application webpage

4.1.3 Diver Mobile Apps and Dive Computers

Many recreational divers keep a record of all their dives, known as a dive log or logbook. Divers can use these records to prove dive experience, plan future dives, and refine diving technique. Advances in technology include dive computers and other mobile devices that can be used underwater allow divers to record dive information including dates, locations, dive depths, and start and end times for each dive. These data are compiled and tracked via one of many available diving apps (e.g., Divemate, Dive Log, MacDive, Subsurface).

Capturing the large volume of dive data recorded by individual divers via personal dive computers and mobile dive logging apps would provide tremendous insight into GOA diving activity. Entries for each dive typically include the date, location, depths, and duration of the dive and could be used to map and characterize diving activity at specific sites of interest and across the GOA.

There may be opportunities to partner with a popular existing dive app to create a tool within its interface that would aggregate the data of other app users who volunteer to share their information with BOEM. However, because there are many different apps in use, partnering with a specific app developer to gather data may not capture the full spectrum of diving activity in the region. Another option might be to create a BOEM-specific research app that allows divers to voluntarily upload their data from other apps or directly from their dive computer to contribute data.

Dive trip operators might also be a good source of dive log data collected via mobile app. If dive operators provided a dive log entry uploaded to a BOEM app for every trip, this would eliminate redundancies in the data by providing one data point for the whole dive trip rather than logging all the similar individual dives from that trip. This would also minimize any concerns individuals might have about sharing their personal dive log data. Harnessing the emergent use of mobile apps and the societal trend to share information, data downloadable from such apps and dive computers would provide unprecedented insight into diving activity at a comparatively low cost and can be easily designed to protect personal private information.

4.1.4 Web-based Portals/Dashboards

Web-based data portals offer a means of centralizing publicly available information provided by authoritative sources (e.g., governmental web sites and databases) with environmental, meteorological, and bathymetric data provided by other third parties, and observations provided by the community (e.g., recreational fishing and diving operators). Such data portals and apps are fundamentally spatial and map-based, allowing users to target information that is relevant to their specific location. This is particularly important for recreational users of the coastal and marine environment, in which transit by private vessels is required for access. Distance, water depth, habitat type, and weather conditions are all factors relevant to the selection of offshore recreational locations that could be informed with use of this technology.

Four web-based portals are reviewed here as examples of the available (albeit underutilized) technology for the distribution and sharing of information for offshore recreation: BSEE OID, Sky Truth, gomXchange, and FishBrain. Each of the four examples are described with screen captures in the sections below. **Table 4-1** summarizes each web app's capabilities for user data access and observational contributions.

Table 4-1. Summary of data accessibility of representative web applications for offshore recreational fishing associated with platforms

User Capability	BSEE Offshore Infrastructure Dashboard	SkyTruth	gomXchange	FishBrain
Access structure location and type information	Yes	Yes	Yes	No
Access latitude, longitude, water depth, and other details for platforms	Yes	No	Yes	No
Access weather, current, and meteorological information near identified platforms	No	No	Yes	Yes
Access fishing-specific information	No	No	No	Yes
Contribute observations	No	No	No	Yes
Available as a mobile application	No	No	No	Yes

BSEE = Bureau of Safety and Environmental Enforcement

4.1.4.1 BSEE OID

BSEE provides OID to provide the number and location of offshore energy facilities as they currently exist (https://www.bsee.gov/stats-facts/offshore-infrastructure-dashboard). A number of web-accessible apps and utilities are offered, including:

- BSEE OID
- Associated OCS Facility Infrastructure map interface (ArcGIS Online)
- BSEE Data Center to access information, conduct online queries of platforms, and download data relevant to the assessment

A screen capture of the BSEE OID is shown in **Figure 4-5**. The dashboard allows users to select the protraction, block, structure, and/or distance range (in the blue bar along the top of the page) to customize searches for particular locations. Users can also select individual point features (colored dots) to extract information about particular features, including type of structure, platform type, water depth, block, latitude, and longitude.

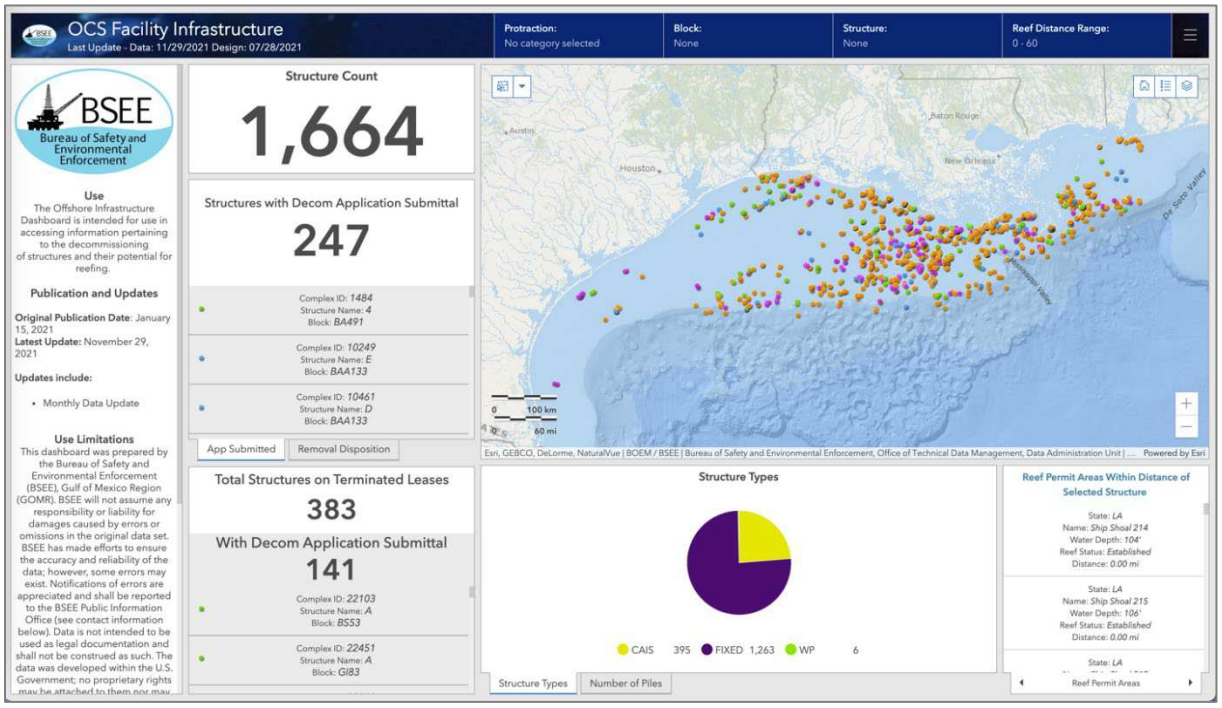

Figure 4-5. BSEE OID for the GOA, which provides information on oil and gas platforms in Federal waters

4.1.4.2 SkyTruth

SkyTruth is a 501(c)(3) non-profit organization that utilizes publicly available satellite imagery (primarily Sentinel-1 and Sentinel-2 satellites in the European Union's Copernicus Program) for environmental and conservation purposes (SkyTruth 2021). Their web-based portal for the U.S. GOA provides location information for platforms and pipelines in Federal waters, pulled from the BOEM infrastructure portal (**Figure 4-6**). Though not designed for recreational fishing, the web-based app provides information on oil and gas platforms in Federal waters, as well as capabilities for satellite surveillance.

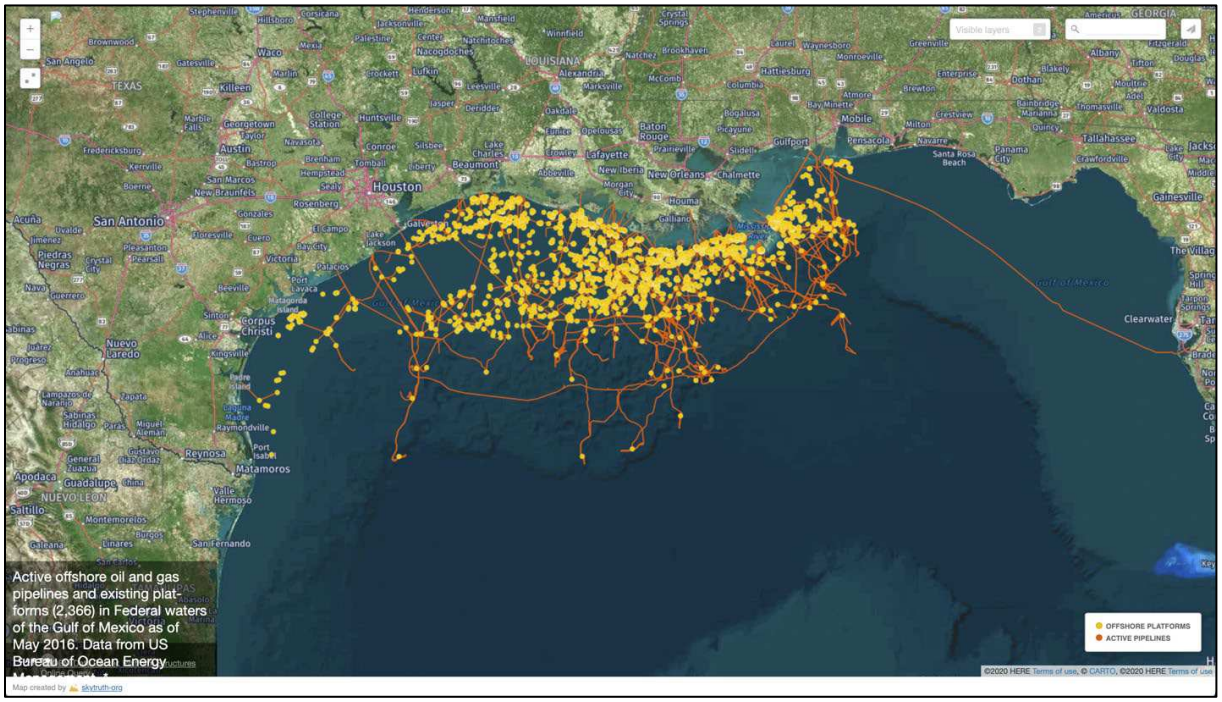

Figure 4-6. SkyTruth web-based portal for the GOA
SkyTruth uses publicly available data sources and satellite imagery to examine conservation issues.

4.1.4.3 gomXchange

"gomXchange" is a publicly available web-based portal for the GOA hosted by 40Geo, Spire, and Setld and is an example of third-party providers who offer "freemium" data services at no cost in order to advertise for additional services and advanced memberships (**Figure 4-7**) (40Geo et al. 2021). Rather than being focused on fishing specifically, gomXchange centralizes data and information, both static and dynamic, that is potentially useful to offshore recreators for weather, ocean temperatures and currents, and infrastructure locations. Users can zoom in and acquire increasingly greater details about both fixed and mobile features (e.g., platforms and vessels).

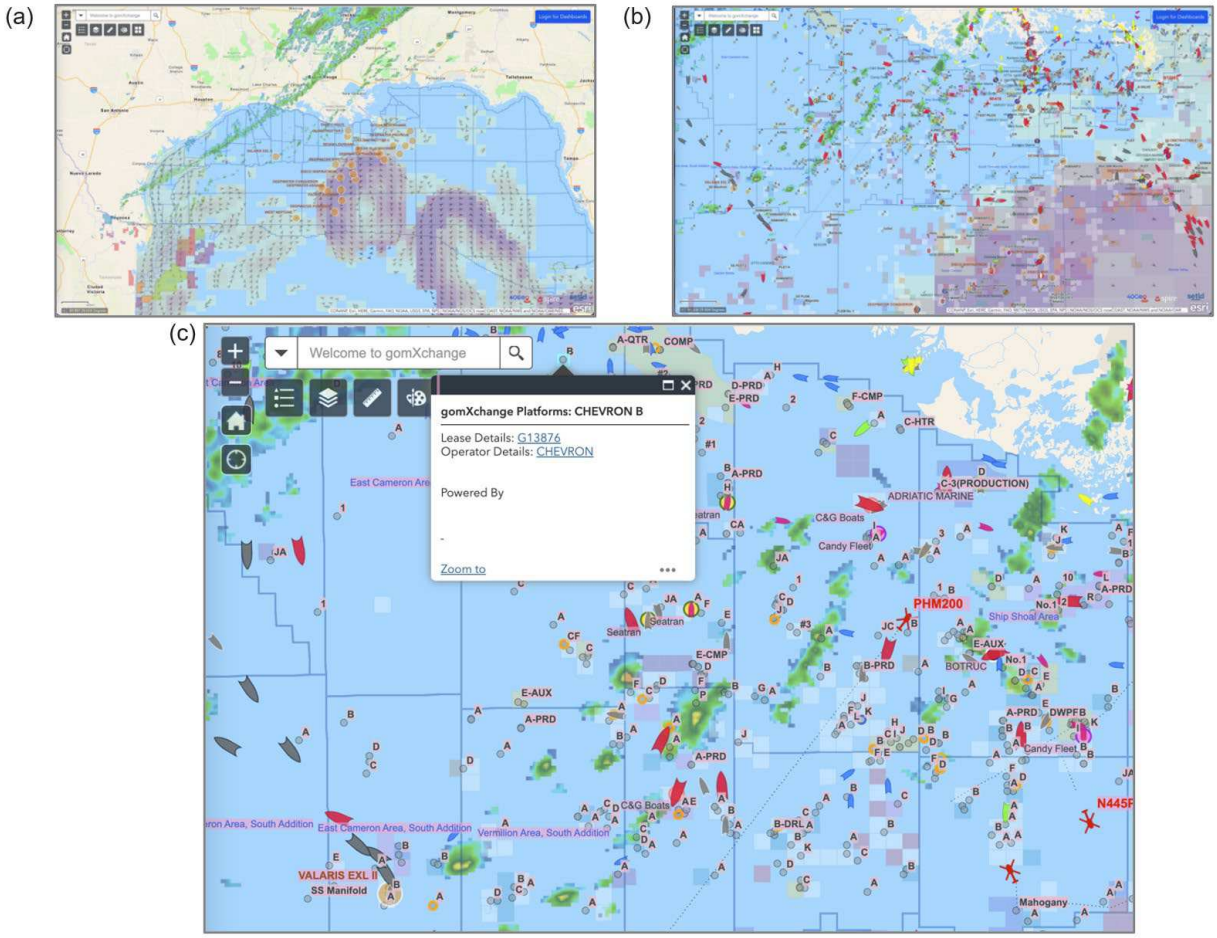

Figure 4-7. Web-based "gomXchange" portal
Web-based "gomXchange" portal for the GOA, which uses publicly available data sources and satellite feeds to provide situational awareness for environmental, maritime, and oil and gas industry needs. Scale bar measures 60 mi (a) and 20 mi (b). Platforms are visible in image (b). Users can extract information about any feature displayed, including platforms, water depths, and distance from shore (c).

4.1.4.4 FishBrain

FishBrain is a web-based map and mobile app that offers both free and paid subscription services for recreational anglers worldwide. Fishing locations and depths, previous catch information, fish behavior information, fishing predictions, weather, and tide data can all be accessed with various subscriptions to the mobile app. Catch information can be downloaded or contributed, and the app provides analysis of weather conditions.

The FishBrain web dashboard screen captures shown in **Figure 4-8** provide an overview in U.S. GOA of coastal and offshore observations. Although the free service is lacking in specific information on offshore platform locations and water depths, the app is capable of both delivering information to users and consuming data provided by users. Greater capabilities offered to users who download the app and pay for a subscription.

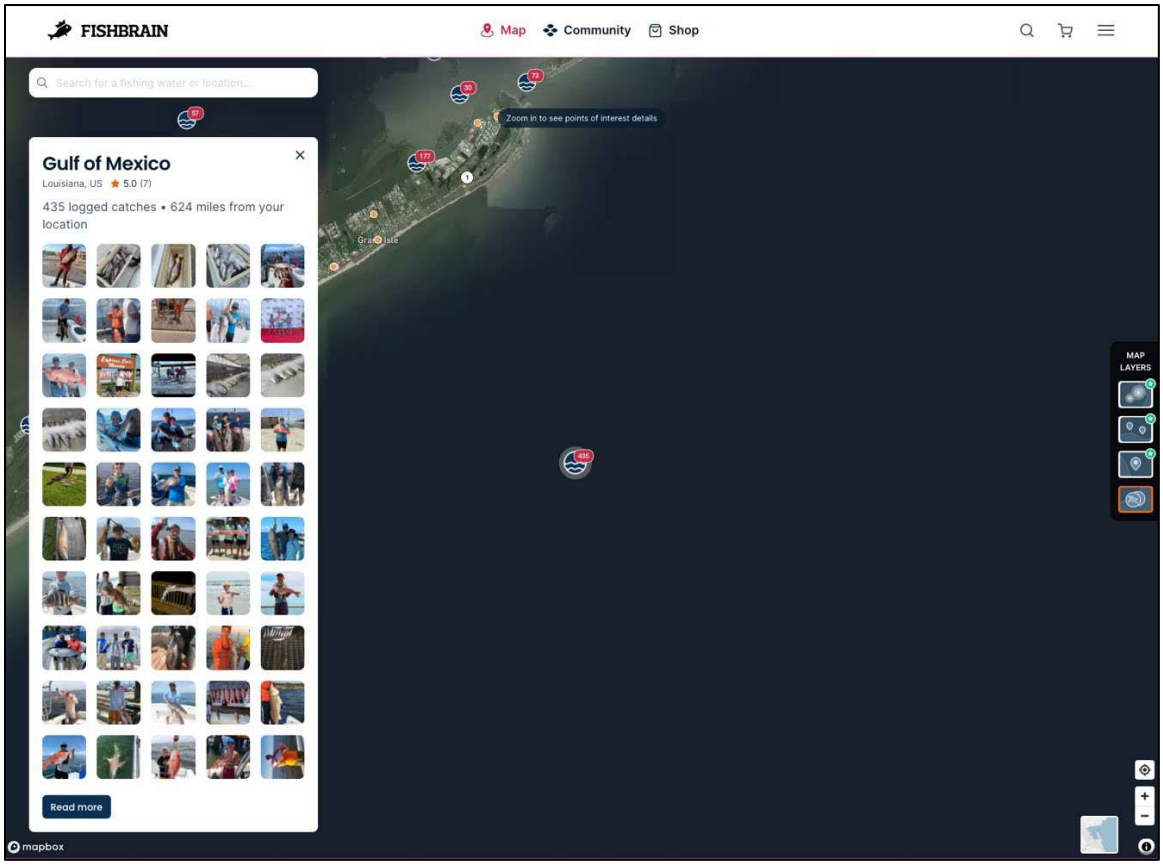

Figure 4-8. FishBrain web-based dashboard
Provides catch location and species information for recreational anglers.

4.1.5 VMS

Fishery managers routinely map commercial fishing effort at high spatial resolution using the VMS. VMS sometimes is referred to as the electronic logbook (Gallaway et al. 2003) because it uses a dedicated GPS unit to record movements of permitted commercial fishing vessels. VMS devices continuously record the vessels position and quickly amass large amounts of data. Interpreting these data requires a filtering step. Generally, vessel speed for short time windows is used to establish whether a VMS vessel is fishing or not. For example, sustained low speeds would indicate trawling, while a stationary position would indicate bottom fishing or catch processing, depending on water depth. In the GOA, those holding permits

for Gulf reef fish and/or coastal migratory pelagic species are required to have a VMS unit on their vessels. The VMS has been a vast improvement over paper logbooks required for holders of various Federal permits. Logbook data have potential reporting bias, particularly with actual coordinates of fishing activity. An example of using VMS data in the GOA to map coral habitat risk from various fisheries may be found in Clark et al. (2018).

VMS, while extremely effective at gathering spatially-based information, is not practical for recreational fishing endeavors due to the sheer numbers of recreational anglers involved. The for-hire permit holders are now using satellite and cellular devices (not smartphones but dedicated cellular-based recorders) as VMS units. Data from these units, when available, would be valuable for estimating platform use by that sector of the recreational community. In fact, this would be the only existing spatially explicit data for recreational fishing activity in the GOA. Interpretation of such data would require filtering and statistical analysis.

4.1.6 Satellite-Based Surveillance

Despite the availability of smartphone apps, their widespread usage by anglers to guide activities, and the apparent willingness of anglers to electronically report their catch, usage rates remain low. It is questionable if self-reporting and other non-probabilistic sampling methods are useful to fishery managers (Midway et al. 2020). Other than self-reporting, example methods of acquiring angler-specific information include surveillance activities, both passive (e.g., VMS) and targeted surveillance (e.g., advanced VMS sensor use and/or satellite image analysis). This section describes example techniques for filling data gaps (particularly gaps in spatially explicit information) using passive and targeted surveillance methods.

4.1.6.1 Automatic Identification System (AIS)

AIS is a type of VMS used to identify vessels, their position, and movement. AIS is a mandatory international navigation safety communications system under the provisions of the Safety of Life at Sea (SOLAS) Conventions endorsed by the International Maritime Organization (IMO). The SOLAS regulation V/19 (*Carriage requirements for shipborne navigational systems and equipment*) requires AIS equipment to be fitted aboard all ships of 300 gross tonnage or more engaged on international voyages, cargo ships of 500 gross tonnage or more not engaged on international voyages, and all passenger ships irrespective of size (IMO 2019).

Per Section 33 of the U.S. Code of Federal Relations (CFR; 33 CFR 164.46(d)), vessels required to have AIS must operate it in U.S. navigable waters (as defined in 33 CFR 2.36) at all times that the vessel is navigating (underway or at anchor) and at least 15 minutes prior to unmooring.

AIS data streams for known vessels with vessel-based transceivers equipped and powered on (also known as “white-listed” vessels) may be intercepted through a network of terrestrial, line-of-sight transceivers, satellite-based systems, and customized on-platform sensors for asset tracking. The information provided by AIS equipment includes unique vessel identification, position (latitude and longitude), course, speed, and destination, when known. Data feeds from AIS service providers can be sampled at variable rates depending on the user’s requirements (e.g., every 2 minutes, hourly, every 12 hours, and so on). These data feeds can then be automatically published to dashboards and apps, as well as analyzed by algorithms such as geofencing around particular geographic features.

One of the challenges associated with VMS is the inability to track “dark vessels” that do not have identification systems (or have systems which have been intentionally disabled to evade monitoring) and thus cannot be tracked using AIS.

4.1.6.2 Internet of Things (IOT)

The IOT describes the network of physical objects, "things," that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet (Oracle 2021). Using mobile technologies and data analytics requiring little human intervention, IOT apps capture and provide access to sensor data via dashboards. Dynamic position tracking of mobile assets such as vessels can be accomplished using both *in situ* sensing and remote sensing techniques (**Figure 4-9**).

For example, mobile asset-tracking devices can be deployed on vessels and use GPS technology without the requirement for AIS. Other technologies include mobile marine radar kits that allow real-time monitoring of radar-detectable vessels that are not reporting via AIS or GPS. Such radar technologies can be deployed on selected platforms or structures to monitor vessel activity and feed the information to web-accessible dashboards.

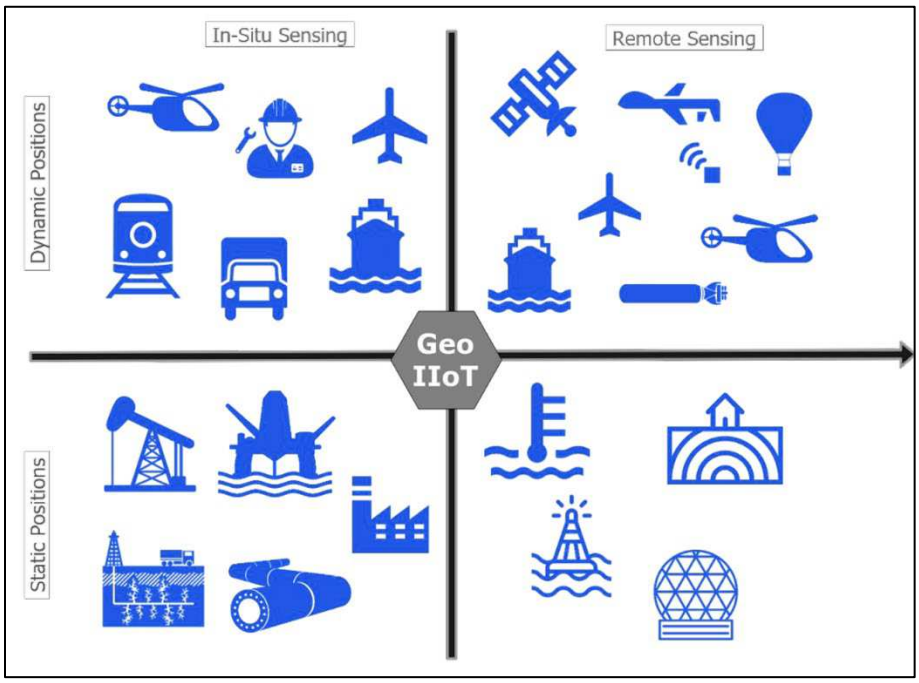

Figure 4-9. The Internet of Things (IOT)
Concept uses both in situ sensing and remote sensing techniques to track the dynamic position of mobile assets in a digital database and integrated web-based reporting platform.

4.1.6.3 Synthetic Aperture Radar (SAR)

In addition to optical (visual) satellite imagery for vessel detection, SAR has been identified as a reliable source of satellite data used for vessel detection based on algorithms that enable characterization of vessel size and typical activities. SAR is of sufficient resolution for detecting all but the smallest of vessels, can image relatively wide areas, and functions independently of daylight or cloud cover. For example, in partnership with Canada's Department of Fisheries and Oceans, MDA (2022) uses radar satellite technology for Dark Vessel Detection (DVD) to identify unreported fishing activities. Though DVD is not designed for monitoring recreational fishing activities, targeted satellite analysis can offer an effective means of examining recreational use of particular geographic locations.

4.1.7 Acoustic Recorders

Acoustic data previously or currently being collected for other studies (NOAA Fisheries 2021c) could potentially be post-processed using a boat detection algorithm to characterize recreational boating activity without deploying additional acoustic recorders. This method does not distinguish between diving and other boat-based activities such as recreational fishing but does show promise as a passive means of monitoring or characterizing boat-based recreational activity patterns at specific sites of interest. For these data to become informative for diving, a directed survey effort to associate boat presence with diving would be needed.

A 2016 study in the eastern GOA (Simard et al. 2016) used Digital SpectroGram (Loggerhead Instruments) autonomous recorders to gather acoustic data at artificial reefs and natural reefs (limestone ledges) over a 2-year period. Acoustic data were processed using a boat detection algorithm that identifies the harmonic peaks generated by smaller recreational boat engines. Based on this analysis, the study was able to characterize boat activity patterns, including visitation rates at artificial reef sites compared with natural reef sites and inter-month variability in boat visitations. If boat activity pattern can be associated with diving likelihood, then such an analysis could provide a useful estimate of diving.

4.1.8 Fixed Cameras Surveillance

Powers and Anson (2016) used security camera footage taken from boat ramps and marinas in coastal Alabama to track activity of recreational anglers during open red snapper season. Using a statistical design to sample video footage, analysts were able to count numbers of boats launched and number of anglers per boat.

4.1.9 Data Mining of Social Media Sites to Determine Other Recreational Users

Beyond fishing and diving, the other recreational uses considered in this study include nearshore (i.e., sea kayaking, and paddleboarding) and offshore (i.e., cruising, sightseeing, marine wildlife/pelagic bird tours) activities. These recreational uses are largely user-driven; there are very few, if any, organizations dedicated to tracking user data for these recreational uses. Furthermore, because these recreational uses and subsequent pursuits—apart from registering a watercraft (e.g., non-motorized, craft-like kayaks) with the State of Texas, Louisiana, or Alabama—require no license, certifications, or the like; they can be pursued by nearly anyone.

Individual kayak or other non-motorized boat owners may engage in kayaking and non-motorized boating activities by on the OCS by taking kayaks offshore on a larger vessel and launching near offshore platforms. Kayaking from shore to the OCS would not be likely nor safe. Subject to watercraft registration by the local jurisdictions, there are very few, if any, other data collected on kayak and non-motorized boat users. Advances in technology including outriggers for kayaks, lighter and stronger kayak materials, navigational GPS, social media documentation, and fitness apps such as PolarisGPS, STRAVA, and Apple Fitness have enabled kayakers take longer voyages and log detailed information about their voyages.

Taking advantage of the concentration of recreational users at port, beach, and harbor locations will be key for gathering future data for these recreational uses. Nearly all recreational users require the amenities of the recreation “hubs” afforded by coastal locations: a launch site like a dock, boat launch, or beach; proximity to others for safety; and, in most cases, off- or nearshore structures like piers, jetties, and oil rigs/platforms providing substrate for underwater sea life or surface water variation/attractants. Conversely, some recreational users may prefer isolation, and recreational activity is not precluded in isolated areas.

Though it remains unclear whether or how much kayakers may interact with platforms, capturing the volume of kayak voyage data recorded by individual recreational users via personal GPS devices and mobile kayaking logging and/or fitness apps would provide tremendous insight into GOA kayaking activity. Entries and data for this use typically include the date, location, and duration of the use and could be used to map and characterize kayaking activity at specific sites of interest and across the GOA.

Because kayaks may be registered with the owner's state of residence and are commercially rented by beach shops, these users may be easier to survey than other recreators who can operate without registration and pursue their activity independently. Appropriate groups to survey include commercial rental shops, guides, those who have recently participated in kayak and other non-motorized group voyages, and users seeking to renew their watercraft registration.

The trip logs and data collected on boat tours may offer the best opportunity for other recreational use data collection. Boat operators are required by the U.S. Coast Guard to log trips but also collect additional data, primarily to understand where their best opportunities exist for maximizing the purpose of the tour, be it scenic or birding. This information would be invaluable to BOEM and could be updated annually based on the optimal conditions tour operators design their trips around. Partnering with Texas Pelagics, for example, would allow BOEM to collect these data directly.

Texas Pelagics logs and records its routes, as well as observations of pelagic bird species. Birding groups (both local and nationwide) travel to the GOA for opportunities to see birds that would otherwise be inaccessible due to their distance from the shore, ocean conditions that prohibit non-motorized use, etc. Though not required to do so, many birding groups voluntarily share data for bird locations and success.

To supplement this limited available data, survey efforts directed at the nexus of organizations and service providers, not unlike the efforts of port samplers for fishing estimates, may be the most effective means of obtaining at least a qualitative understanding the magnitude and distribution of these other recreational uses relative to offshore platforms.

4.2 Summary of Data Collection Methods

Absenting any incentivization, an analysis of the potential approaches and methods for collecting recreational use data is provided in **Table 4-2**. Strengths and weaknesses of the approaches were assessed across all types of recreational users. Weaknesses listed in the table may contribute to data bias and potentially erroneous conclusions without the use of advanced statistical applications.

Table 4-2. Summary of strengths and weaknesses of recreation use data collection methods

Data Collection Method	Private Boat Recreational Fishing	Charter/Headboat Fishing	Diving	Pelagic Birding	Kayaking/ Non-Motorized Boat Use	Strengths	Weaknesses
Access point in-person intercepts	Y	Y	Y	N	N	• Reliable and precise harvest estimates • Minimizes angler burden to report • Target areas based on need • Provides real-time harvest estimates • Costs to modify intercept surveys low	• Qualified labor and resource intensive • Limited survey target areas (no private access) • Voluntary so anglers can refuse the interview • Survey does not include spatially explicit fishing location information • Could be modified to include identifying fishing locations in proximity to offshore platforms
Telephone and email surveys	Y	Y	Y	Y	Y	• Targets additional random anglers not at trip time and access points • Less time constraint from access point fishing trips • Emails allow time convenience for respondents • Can be used to address very specific information gaps • BOEM can pursue this independently • Costs to modify household surveys low	• Calls can be labor intensive • Internet responses can be ignored or intermittent • Requesting information from past that may not be recollected accurately • Distaste for telemarketer tactics • Misses anglers with license exemptions • Accurate fish identification dependent on angler's species familiarity • May not include spatially explicit fishing location information • Could be revised include identifying fishing location in relation to offshore platforms • May be challenging to reach intended respondents or achieve adequate sample size
Mandatory self-reporting phone apps	Y	Y	N	N	N	• Anglers required to report harvest data • Wide-reaching range of trip input (including private docks and marinas) • Potential for more representative data collected from large number of respondents • Angler participation promotes interest and can help lead to more adaptive management process	• Difficulty with electronic media applications (operation and access) • Enforcement/verification/validation of reporting required • App does not include spatially explicit fishing location information, specifically identifying proximity to offshore platforms • App could include dropping map pins in general fishing locations or tracking trip on GPS • Costs to modify apps to record trips and track positions moderate

Data Collection Method	Private Boat Recreational Fishing	Charter/Headboat Fishing	Diving	Pelagic Birding	Kayaking/ Non-Motorized Boat Use	Strengths	Weaknesses
Voluntary self-reporting phone apps	Y	Y	Y	N	Y	• Anglers required to report harvest data • Wide-reaching range of trip input • Potential for more data representative collected from large number of respondents • Angler participation promotes interest and can help lead to more adaptive management process • Takes advantage of dive data that is already being logged • Covers entire region • May include location, depth, date, and activity duration	• Potential low respondent reporting rate (Midway et al 2020) • Difficulty with electronic media applications (operation and access) • Verification/validation of reporting required • App does not include spatially explicit fishing location information, specifically identifying proximity to offshore platforms • App could include dropping map pins in general fishing locations or tracking trip on GPS • Will rely on partnerships to access data • May be challenging to aggregate data across multiple app platforms • Costs to modify apps to record trips and track positions moderate
Focus groups	Y	Y	Y	Y	N	• Synthesizes expert knowledge • Can be used to address very specific information gaps • BOEM can pursue this independently • Costs to engage in additional focus group discussions are low	• Data collection and processing are labor and time intensive
Acoustic surveys	Y	Y	Y	Y	N	• Can utilize existing data or data collection programs • Passive data collection	• Does not distinguish between recreation types • Only covers areas where acoustic recorders are placed • May rely on partnerships to access data • Costs for post-processing of acoustic data already being collected using a boat detection algorithm to characterize recreational boating activity is moderate

Data Collection Method	Private Boat Recreational Fishing	Charter/Headboat Fishing	Diving	Pelagic Birding	Kayaking/ Non-Motorized Boat Use	Strengths	Weaknesses
Utilize tour boat operator information	Y	Y	Y	Y	N	• Takes advantage of tour operation data that is already logged • Updated annually • Responsive to natural shifts/changes in conditions (i.e., hurricane or storm change conditions, migration patterns changing) • Costs of recording trips and track positions is low	• Relies on partnerships with operators • Subject to operation success; no data are collected if no tours are available

5 Study Summary

5.1 Recreational Uses of Platforms

Most of the information uncovered during this effort was related to recreational fishing and, to a lesser extent, diving. A concerted effort was made to better understand users classified as "other."

One group in particular—birdwatchers—has an immense following worldwide, and the northern GOA is on a major flyway for many migratory species (Russell 2005). Key informant discussions found that some avid bird watchers do venture out into the GOA in search of oceanic seabirds, but platforms are not necessarily a target on most trips. Their fundamental goal is to find oceanic (blue water) conditions preferred by their target species, which generally requires traveling beyond the continental shelf break, which occurs at about 300-m water depths. Key person discussions with bird watching groups focusing on pelagic seabirds indicated that water depth and distance from shore were the most important determinants.

In addition to bird watching, other possibilities for wildlife watching exist in the northern GOA. One example may be the whale shark (*Rhincodon typus*), a large shark that aggregates predictably at various locations around the globe. Many of these aggregation sites support shark-watching ecotourism businesses. Whale sharks aggregate in offshore waters of the northern GOA, but no regular tourism seems to have developed (Hoffmayer et al. 2021), and their aggregation has not been shown to be associated with platforms.

5.2 Magnitude of Recreational Uses

The relative magnitude of platform use by recreational anglers and divers for the coastal states of Alabama, Mississippi, Louisiana, and Texas was last determined for the year 1999 (Hiett and Milon, 2002). They found the proportion of private boat trips using platforms for the coastal states was 20.2% (823,075 trips). The average proportion of charter boat trips for these same states targeting oil and gas platforms was 32.3% (96,337 trips). An average of 93.6% of dive trips (83,780 trips) were made around platforms. A review of more recent recreational survey data from the Federal sources and Alabama, Mississippi, and Louisiana state programs (**Section 3.2.2**) indicate that numbers of trips offshore into water depths where most of the platform-related trips were made in 1999 have changed little.

5.3 Geographic Extents of Recreational Uses

The geographic extent of offshore platform use by recreational anglers and divers off the Central Planning Area was assessed through surveys over 40 years ago (e.g., Ditton and Auyong 1984) (**Section 3.1**). These early studies found most users preferred to stay close to home and travel a minimum distance over water to reach platforms standing in water depths great enough (≥60 m) to harbor desired species. As a result, activity was centered around the Mississippi Delta, including Main Pass and West Delta protraction areas. Recreational anglers and divers using this region experienced safe trips in relatively small boats (~8 m), burned less fuel, and maximized their time on the water. The proximity of population centers such as Baton Rouge and New Orleans ensured higher numbers of recreational users were able to trailer boats overland to various access points (ramps, hoists, marinas). Undoubtedly, some anglers or divers with larger, more powerful, and seaworthy vessels could travel over water from as far away as Mississippi, Alabama, and Florida to fish this area. The factors identified by these early studies, particularly the maximum distances users would travel to fish or dive around platforms, proved

instrumental in designating deployment sites for decommissioned platforms sanctioned under the Rigs-to-Reef program (Reggio 1989).

5.4 Site-specific Determinants of Recreational Uses

Early studies revealed that users visited multiple platforms during a typical trip (Gordon 1993). Reasons for moving from platform to platform depended on fishing success, presence of other anglers or divers, water clarity or color, sea conditions, transit distance and commercial fishing activity. Anglers were willing to travel a total of 100 km during trip to fish around platforms. Boaters in small vessels may travel farther from shore to where platforms are present because they provide at least perceived security to boaters in small vessels.

Forty years after these initial studies, the geographic patterns of recreational use of platform-based recreation still hold, but other aspects of platform-associated, recreational fishing and diving have changed. Some obvious changes lie in the reduced number of platforms due to decommissioning, changes in fishery regulations, and technological advances in vessel construction, horsepower, and fishing-finding capabilities.

The most noticeable change since the 1980s has been the removal of more than half of all the standing platforms (**Section 3.2**). Decommissioning of platforms has reduced the number of platforms from over 4,000 in 1985 to 1,664 in 2022. Expected effects of this reduction would include, but not be limited to, intensified recreational effort and crowding at certain platforms. Some portion of anglers and divers are now motivated to travel greater distances to avoid the crowds and experience better fishing or diving conditions. Schuett et al. (2015) found that 30% of Texas anglers sought distant fishing areas away from crowds.

A major concern among anglers and divers with decommissioning is the loss of the standing platforms. Toppled structures are acceptable to most anglers and divers, but conversations with key persons and other research indicated that many anglers and divers prefer standing platforms over toppled structures for several reasons, including improved fishing diversity and diving experience and ease of positioning.

Changes in fishery regulations may affect patterns of platform use by anglers and divers. An example comes from the management efforts for the most important species sought by platform anglers and divers in the GOA, the red snapper. Successful red snapper management depends on accurate estimates of abundance, age structure, natural mortality, and fishing mortality. Information on catch and effort from both commercial and recreational anglers are needed to obtain these estimates. The commercial sector is much easier to sample than the recreational anglers (e.g., SEDAR 2018). Recreational catch and effort are an important but elusive component of red snapper management; this data is elusive because recreational fishing is notoriously difficult to track and quantify. At present, the Gulf of Mexico Fishery Management Council reduces effort by shortening the fishing season and setting catch limits for those who fish Federal waters. In recent years, shortened seasons have created brief bouts of intense effort with total allowable catch totals being met within 3 to 40 days (Powers and Anson 2019). Nevertheless, seasonal closures reduce the overall number of recreational trips made in coastal states.

The size, power, and fuel range of recreational vessels has increased markedly since the 1980s, expanding the area and water depths of the GOA accessible for recreation. Typical center-console-style sport fishing boats may still be around 8 m in length (Schuett et al. 2015), but, at the larger end (10 to 15 m), these boats may be powered by multiple outboard motors (highest available outboard power up to 600 hp per engine). Marine electronics for recreational anglers and divers also have advanced considerably over the years. New sonar technology allows recreational anglers to explore more widely and locate bottom fish in greater water depths and with greater precision than ever before. In the GOA, deep-water structures

attract mesophotic (deep reef) fish such as barrelfish (*Hyperoglyphe perciformis*), longtail bass (*Hemanthias leptus*), snowy grouper (*Hyporthodus niveatus*), Warsaw grouper (*Hyporthodus nigritus*), and tilefishes (*Caulolatilus* spp., *Lopholatilus chamaeleonticeps*). Electric-powered reels designed for recreational anglers have further paved the way for recreational anglers to routinely fish in much deeper waters and catch species previously unavailable to them. The influence of these technological advances in changing habits of recreational anglers and divers needs to be assessed.

5.5 Feasibility and Utility for Further Data Collection

In addition to vessel and electronic technological advances, changes in other fields could promote cheaper, faster, more efficient ways of gathering data focused on recreational platform use. Gathering spatially explicit information for any fishery can be a complicated and expensive challenge (e.g., Gardner et al. 2022). Potential methods reviewed in this report include (but is not limited to) remote sensing (satellite-based tracking of vessels), electronic reporting (smartphone applications), use of security cameras at boat ramps and marinas, satellite imagery, data mining of social media sites (such as YouTube), and revised direct contact protocols.

Early studies partnered with established regional statistical surveys (e.g., MRFSS) to, over time, modify questions asked during on-site interviews and region-wide telephone surveys (Witzig 1986; Hiett and Milon 2002). This conventional approach is still viable today as the MRFSS has been recently revised as the MRIP. Although electronic reporting sounds appealing and has been used in several instances, garnering dedicated support from anglers using these methods has been shown to be a drawback (Stunz et al. 2016). Serious anglers and divers are focused on catching their targeted species and may resist interrupting that process to enter information into a mobile phone.

Based on our findings, we ranked data collection methods in terms of their comprehensiveness and efficiency from most promising (1) to least promising (6):

1. Modify intercept surveys and household surveys from current NOAA Fisheries' MRIP
2. Use electronic reporting by smartphone apps to record trips and track positions
3. Deploy cameras on a sample of platforms to obtain samples of use
4. Use aerial images taken at statistically designed sample of platforms
5. Sample security cameras at boat ramps and marinas
6. Data mine social media sites for fishing effort and locations

5.6 Major Insights from the Study

Findings from this study suggest that recreational fishing and diving regularly occur in the vicinity of offshore oil and gas platforms (both extant and decommissioned) in both the Central and Western Planning Areas. Platforms closer to shore are likely to be used more because they are more accessible, especially for individual users. Furthermore, the nature of the platform structure (e.g., active, standing decommissioned, toppled-in-place, or reefed) and characteristics of its location (e.g., water depth, typical current patterns) also greatly influence desirability for recreation.

Major study insights that should inform further investigation and activities by BOEM include the following:

- Platforms have and still do play an important role in the recreational activity of the Central and Western Planning Areas as destinations for fishing trips and diving trips.
- Removal of platform structures currently used by recreators reduces the number of sites fishers and divers can utilize and will increase crowding and pressure on the remaining structures.

- Seasonal closures of popular recreational species such as red snapper will likely affect intensity and temporal patterns of platform use in areas near population centers or fishing ports.
- The ideal platform for a dive trip is different from the ideal platform for fishing, but both types of recreation benefit from vertical habitat retained throughout the water column; placement in areas that are accessible from shore and optimal from an ecological perspective; and features that facilitate recreational use (e.g., ease of mooring, horizontal orientation allowing divers to spread out).
- Scientific uncertainty remains about how best to maximize the long-term benefits (for both ecosystems and recreation) of platforms retained in the water after decommissioning. Directed studies continue to be needed to assess both the benefits (habitat creation, recreational amenity) and the potential negative impacts (long-term overfishing due to aggregation, spread of invasive species).
- Platforms may provide important future opportunities for supporting education, research, and recreation.

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Appendix A: Literature Review

Table A-1. Journal articles and publications

During the Literature Review task, each resource was rated on nine relevance criteria on a scale of zero to two or three (scale indicated in parentheses under each criterion). Criteria ratings were summed to assign each resource an overall Relevance Score (max value = 25). Resources may be evaluated according to the following relevancy score scale: 0-2 = Poor; 3-7 = Fair; 8+ = Good. Additional literature that is included in this Synthesis Report is provided in **Section 6**.

Resource Name	State / Region	Content Notes	Back-ground (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Shively. 2017. Submission of Testimony to the House Committee on Natural Resources Subcommittee on Energy and Mineral Resources	TX	Professional testimony to the US House of Representatives from TPWD Artificial Reef Program Manager discussing the use of oil platforms and other structures as artificial reefs. The testimony provides summary statistical recreation use data regarding these structures and supporting economic data and details the perceived value of the rigs-to-reefs program on the Texas economy and discusses the offshore biological habitats the program provides for.	2	3	3	3	3	0	0	0	0	14
Hiett, R. L. and J. W. Milon. 2002. Economic Impact of Recreational Fishing and Diving Associated with Offshore Oil and Gas Structures in the Gulf of Mexico: Final Report	GOA	Similar scope to our study; methods for determining scale using interview-based survey. Report of survey data that enumerates recreational fishing, diving, and private and charter boating trips to oil and gas (O/G) platforms and artificial reefs by state. No georeferenced data was included but might be available if requested because GPS coordinates were included on some survey forms.	2	2	2	2	3	2	0	0	0	13
Franks. 2000. Pelagic fishes at petroleum platforms in the northern Gulf of Mexico	GOA	Contains info on recreational fishermen interviews & proposed research uses of platforms - Linton (1994) reported the number of platforms in the northern GOA doubled during the 1980s while both the number of species ankle total amount of finfish landed from the northern GOA tripled during the same period. - Regular fluctuations in diversity and abundance of pelagic fishes at individual platforms appear to be the norm, with higher abundances generally associated with increased water temperatures. - The overall radius of influence for large pelagics at platforms is unknown, however, offshore recreational fishermen often catch tunas and marlins within 5 km of platforms.	2	2	2	2	1	0	1	1	0	11

Resource Name	State / Region	Content Notes	Back-ground (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Stanley, Wilson. 1989. Utilization of offshore platforms by recreational fishermen and scuba divers off the Louisiana coast	LA	Recreational use patterns associated with offshore platforms off the Louisiana coast were investigated using a survey and a logbook program to determine how far avid recreational anglers and divers would travel to the oil and gas structures. Geographical data was limited to three large regions off LA coastline. The report offers summary statistics of use by region. - Offshore fishing and recreational diving by Louisiana sportsmen is centered around the oil and gas platforms. It has been estimated that oil and gas platforms are the destination of approximately 37% of all saltwater recreational angling trips (Witzig, 1986) and over 70% of all recreational angling trips in the Exclusive Economic Zone (more than 3 miles from shore) in Louisiana (Reggio, 1987). Oil and gas platforms are a valuable resource for recreational divers in the state (Roberts and Thompson, 1983) since there are few suitable hardbottom areas or natural reefs off the Louisiana coast, the nearest natural reefs being located at least 75 miles offshore. A recent survey of the 1987 Grand Isle Tarpon rodeo in Louisiana indicated that 100% of all fish entered in the spearfishing category were speared at or near oil and gas structures (Stanley, unpublished). - The importance of platforms as de facto artificial reefs in Louisiana cannot be over-emphasized. Without these structures offshore sport fishing opportunities in Louisiana would be greatly reduced (Dugas et al., 1979). - Reports on temporal use patterns of oil and gas structures were conflicting: A study by Witzig (1986) indicated that March and April were the most popular months for fishing oil and gas structures, while Ditton and Auyong (1984) found that recreational divers and anglers were most prevalent around the structures on weekends from May to August. Temporal use pattern results of recreational divers from Roberts and Thompson (1983) agreed with the Ditton and Auyong study.	2	2	2	2	2	1	0	0	0	11
Gallaway, et al. 2009. Red snapper life history	GOA	Establish the importance of oil and gas platforms as habitat for harvestable red snapper Prior to the proliferation of artificial reefs in the northern Gulf, age 2 red snapper may have historically occurred mainly over open-bottom, sand-mud benthic habitat where natural and shrimp trawl bycatch mortality was high. Age 2 fish dominate red snapper populations at artificial reefs, whereas the age composition of red snapper at natural reefs usually show older ages are dominant. The present day red snapper fishery is heavily dependent on catches at artificial reefs. Evidence is presented that suggests red snapper production in the northern Gulf likely has been increased by the establishment of significant numbers of artificial reefs.	1	2	1	2	2	1	1	0	0	10
Wilson, et al. 2003. Rigs and Reefs: A Comparison of the Fish Communities at Two Artificial Reefs, a Production Platform, and a Natural Reef in the Northern Gulf of Mexico	GOA	Good background info and resources in lit cited - The concept of using oil and gas platforms as artificial reefs i.e. “Rigs-to-Reefs” is strongly supported by recreational and commercial fishers and their respective organizations such as the Coastal Conservation Association. - Diversity at all sites is less than natural reefs (e.g., WFGB); however, numbers can equal or exceed natural systems (red snapper is one of the most numerous fish species present) - Red snapper and amberjack tend to be most heavily targeted by recreational and commercial fishers. - Stanley and Wilson (1997) proposed that vertical profile is important in maintaining the fish density resident at standing platforms. - Standing platforms support greater fish biomass.	2	2	0	2	1	2	1	0	0	10
Ditton and Auyong. 1984. Fishing offshore platforms Central Gulf of Mexico - An analysis of recreational and commercial fishing use at 164 major offshore petroleum structures	GOA	- The distance from shore to platforms utilized by offshore fishermen and divers increased from east to west in the MMS study area, and the distances to the platforms utilized by recreational divers was greater than those platforms used by anglers. - Distance to population centers greatly influenced use.	1	2	2	1	2	0	0	1	0	9

Resource Name	State / Region	Content Notes	Back-ground (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Gordon, 1993. Travel Characteristics of Marine Anglers Using Oil and Gas Platforms in GOM	GOA	Good info on distance traveled & platform used by recreational anglers Petroleum platforms were a principal fishing destination, and platform anglers traveled an average distance of 75.5 km (40.7 n.mi.) to and from offshore fishing locations. In fishing an average of 6.5 platforms per trip, these anglers traveled about 21.3 km (11.5 nmi.) between the first and last platform visited. Mean total distances for platform anglers were 96 km (51.8 nmi). Travel distances for bay, nearshore, and bluewater anglers were also obtained.	1	2	2	1	3	0	0	0	0	9
Regio, Villere. 1989. Petroleum Structures as Artificial Reefs: A Compendium	GOA	This compendium is made up of 18 papers and summary comments presented in a special session on Rigs-to-Reefs at the Fourth International Conference on Artificial Habitats for Fisheries held in 1987. The papers provide summary non-quantitative information on recreational uses such as SCUBA diving that was occurring at that time at oil and gas platforms.	2	2	1	2	2	0	0	0	0	9
Snodgrass, et al. 2020. Potential impacts of oil production platforms and their function as fish aggregating devices on the biology of highly migratory fish species	GOA / CA	Primarily a lit-review paper; good background & some highly migratory species (HMS) recreational info - With such large stock boundaries it is unlikely that HMS interactions with OPPs will have a significant impact at the stock level, however, there could be impacts at local or regional levels. - Several of the deeper OPPs are of substantial importance to the recreational fisheries (Dugas et al. 1979; Ditton and Auyong 1984; Stanley and Wilson 1989; Gordon 1993; Jablonski 2008) and moderate importance to some commercial fisheries (Continental Shelf Associates, 2002). Prior to the establishment of OPPs, recreational pelagic sportfishing offshore of Louisiana was almost non-existent (Dugas et al. 1979). - While substantial recreational, and some commercial handline fishing occurs for tunas and other pelagic species around OPPs (Dugas et al. 1979; Ditton and Auyong 1984; Franks 2000). - By 2009, more than 70% of wells were being drilled in depths greater than 300 m and exploratory drilling exceeded 3000 m (Richardson et al. 2004).	1	2	0	1	2	1	1	1	0	9
Stanley, Wilson. 1990. A Fishery-dependent Based Study	LA	Study of Fish Species Composition and Associated Catch Rates Around Oil and Gas Structures Off Louisiana	2	2	1	1	1	2	0	0	0	9
Downey, et al. 2018. Habitat-Specific Reproductive Potential of Red Snapper- A Comparison of artificial and nature reefs in the NW GOM	GOA	Comparison of red snapper reproductive potential on GOA natural and artificial reefs in the GOA	2	2	1	1	0	1	1	0	0	8
Powers, et al. 2013. Gulf-wide decreases in the size of large coastal sharks documented by generations of fishermen	GOA	Used quantitative measurements of shark sizes collected annually and independently of any scientific survey by thousands of recreational fishermen over the last century to document decreases in the size of large sharks from the northern Gulf of Mexico.	1	2	1	0	1	1	1	0	1	8
Stunz, et al. 2015. iSnapper_20145 Results_1 Marine Recreational Information Program	GOA	During the 10-day 2014 season a total of 163 trips were logged using the app, and these anglers harvested a total of 1,519 Red Snapper. Additional data collected included trip length, general fishing location, fishing depth, number of anglers, and number of fish released. Self-reported data was validated by comparing trips submitted using iSnapper to dockside creel interviews (259), with a total of 11% of trips validated.	1	2	1	0	2	0	0	2	0	8
Cowan and Rose 2016. O+G Platforms in the GOM - relationship to fisheries	GOA	- Although platforms may contribute to same-sex sexual behaviour of some species, this increase can be easily offset by increased fishing pressure. - platforms may increase fishing mortality on red snapper by providing obvious visual marker of where to fish, concentrating fish, and thereby increasing fishing efficiency.	1	2	1	1	0	0	2	0	0	7
Kolan. 2011. Benefits of Leaving Oil and Gas Rigs Intact to Serve as Artificial Reefs	GOA	Beneficial attributes of not removing offshore oil and gas platforms.	2	1	0	1	1	0	2	0	0	7
Kolian and Sammarco. 2005. Mariculture and Other Uses for Offshore Platforms: Rationale for Retaining Infrastructure.	GOA	Good background info and resources in lit cited The loss of platforms has not yet inspired a significant response from the recreational fishing sector, although some fishermen are beginning to notice platform removals and becoming strong advocates of their retention (McNemar 2003).	1	2	0	1	2	1	0	0	0	7

Resource Name	State / Region	Content Notes	Back-ground (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Shuett, et al. 2015. Attitudes Behavior and Mgt Preferences of TX Artificial Reef Users	TX	Conducted a survey to provide the Texas Artificial Reef Program with information on respondents' fishing and boating behavior, awareness and use of reefs as well as other management topics. Report provides enumeration of uses, types of uses, and locations for each use type. The report also captures the preferences of for artificial reef types and locations as asserted by the recreational users surveyed.	1	2	1	0	2	1	0	0	0	7
Stanley, Wilson. 1991. Factors Affecting the Abundance of Selected Fishes near Oil and Gas Platforms in the Northern Gulf of Mexico	GOA	Good info on species preference which may influence recreational angler effort Reef fish, Atlantic croaker, and silver/sand seatrout abundances were highest near large, structurally complex platforms in relatively deep water. High spotted seatrout abundances were correlated with small, unmanned oil and gas platforms in shallow water. Pelagic fish, bluefish, red drum, cobia, and shark abundances were not related to the physical parameters of the platforms.	1	2	1	2	1	0	0	0	0	7
Streich, et al. 2017. A Comparison of Fish Community Structure at Mesophotic Artificial Reefs and Natural Banks in the Western Gulf of Mexico	GOA	Multivariate analyses suggested that fish communities at artificial reefs were distinct from those at natural banks. Post hoc analyses indicated that the differences were driven by high abundances of transient, mid-water pelagics and other gregarious species at artificial reefs. Many fisheries species, like the Red Snapper Lutjanus campechanus, were found in both habitat types, with density at artificial reefs estimated to be nearly eight times greater than at natural banks.	1	2	1	1	0	1	1	0	0	7
Stunz, et al. 2020. GORI Review of Standing vs Reefed Oil and Gas Platforms	GOA	Reviewed the current state of scientific knowledge comparing the ecological function and habitat value of standing and reefed platforms in the northern GOA and identify critical information gaps in need of future research with special emphasis on the ecological functionality of standing platforms and performance related to upper-water column benefits.	1	2	1	1	0	1	1	0	0	7
Alabama Dept of Conservation and Nat Resources. 2014, 2015, 2016, 2020. Preliminary Results of Alabama Red Snapper Reporting	AL	Annual red snapper catch and landing information.	1	2	2	0	1	0	0	0	0	6
Brewton, et al. 2020. Trophic ecology of red snappers on natural and artificial reefs	GOA	Study of red snapper on natural reefs and oil and gas structures.	1	2	0	1	1	0	1	0	0	6
CSA 2002. Deepwater Program: Bluewater Fishing and OCS Activity, Interactions Between the Fishing and Petroleum Industries in Deepwaters of the Gulf of Mexico	GOA	Some info on recreational fishery use / access: section 3.2.2.4 Primary Fishing Areas.	1	2	0	0	2	0	0	1	0	6
EcoRigs. 2011. Platform Removal Brief	GOA	National Environmental Policy Act (NEPA) analysis of removing offshore oil and gas platforms.	2	1	0	1	1	0	1	0	0	6
Kaiser, et al 2020. An Update on the Louisiana and Texas Rigs-to-Reefs programs in the Gulf of Mexico	GOA	Excellent background info in recent decades exploration has been dramatically curtailed. Shelf production is not being replenished by drilling.	2	2	1	0	0	1	0	0	0	6
Liu, et al. 2017. Estimation of Total from a Population of Unknown Size and Applications to Estimating Recreational Red Snapper Catch in Texas	TX	Red snapper population estimation based on recreational catch data.	0	2	2	0	1	1	0	0	0	6
Streich, et al. 2018. Habitat Specific Comparison between W GOM artificial and natura habitats	GOA	Used fishery-independent vertical line surveys to evaluate whether gear efficiency and selectivity is similar while assessing reef fish populations at oil and gas platforms, artificial reefs, and natural banks in the western Gulf of Mexico.	1	2	0	1	0	1	1	0	0	6
Texas Parks and Wildlife Department. no date. Texas Rigs to Reef Plan 3	TX	Present Texas Rigs-to-Reef program and justification to continue using oil and gas platforms as artificial reefs.	1	2	0	0	1	1	1	0	0	6
Ajemian, et al. 2020. Movement patterns and Habitat Use of Tiger Sharks GOM	GOA	Study of tiger sharks seasonal and spatial distribution across the GOA.	0	2	0	1	1	0	0	1	0	5
Bull, et al. 2008. Artificial Reefs as Fishery Conservation Tools: Contrasting the Roles of Offshore Structures Between the Gulf of Mexico and the Southern California Bight	GOA / CA	Indicates that diving at oil rig platforms is a common recreational use. Suggests that natural reefs and platforms have become refugia for increasingly rare and overfished species that could attract divers. Offers no quantitative data that meets study objectives.	1	2	0	0	1	1	0	0	0	5

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Kasprzak. 1998. Use of Oil and Gas Platforms as Habitat m Louisiana's Artificial Reef Program	GOA	Older, but useful use and scale metrics for recreational fishing. - Reggio (1987) estimated that 70% of all offshore saltwater fishing trips in the Exclusive Economic Zone off Louisiana were destined for one or more of these oil and gas structures. Furthermore, anglers who fished around platforms caught larger, more desirable, and greater numbers of fish than did marine recreational fishermen who fished other areas (Witzig, 1986). Avanti, Inc. (unpublic.), using data from the Marine Recreational Fisheries Survey, estimated that 30% of the entire recreational fishery catch of approximately 15 million fish off Louisiana and Texas were caught near platforms.	1	2	1	0	1	0	0	0	0	5
Rezek, et al. 2018. Structural and functional similarity of epibenthic communities on standing and reefed platforms in the northwestern Gulf of Mexico	GOA	Good background info and resources in lit cited reefed platforms support similar fundamental ecological functions as standing platforms in the Gulf of Mexico. Thus, the current reefing practice of removal of the upper 26 m of the structure does not substantially influence the functionality of these systems, and the retained structure maintains beneficial habitat for epibenthic communities.	1	2	0	1	0	1	0	0	0	5
Scarborough, Bull, et al. 2008. Artificial Reefs as Fishery Conservation Tools: Contrasting the Roles of Offshore Structures Between the Gulf of Mexico and the Southern California Bight	GOA / CA	There is evidence that the artificial habitat supplied by platforms in the Gulf of Mexico has increased the regional carrying capacity for economically important reef fish species such as red snapper. The area of influence of a Gulf platform on the OCS is reported to be 16–20 m from the platform. Fish densities within 20 m are 3–60 times higher than soft bottom substrate (Wilson 2000, 2003).	1	2	0	1	0	0	0	1	0	5
Topping, et_al. 2019. Comparison of Private Recreational Fishing Harvest and Effort for GOM red snapper	GOA	Comparison of Private Recreational Fishing Harvest and Effort for Gulf of Mexico Red Snapper during Derby and Extended Federal Seasons and Implications for Future Management.	1	2	0	0	1	1	0	0	0	5
Ajemian, et al. 2015b. Analysis of Artificial Reef Fish Community Structure along the Northwestern GOM Shelf	GOA	Good background info - Our work indicates that managers of artificial reefing programs (e.g., Rigs-to-Reefs) in the GOA should carefully consider the ambient environmental conditions when designing reef sites. For the Texas continental shelf, reefing materials at a 50–60 m bottom depth can serve a dual purpose of enhancing diving experiences and providing the best potential habitat for relatively large Red Snapper.	0	2	0	1	1	0	0	0	0	4
Benfield, et al. 2019. Documenting deepwater habitat utilization by fishes and invertebrates associated with Lophelia pertusa on a petroleum platform	GOA	Good Background (LA)Survey techniques - some info recommendations	1	2	0	0	0	0	1	0	0	4
Bolser, et al. 2020. Environmental and Structural Drivers of Fish Distributions among Petroleum Platforms across the GOM	GOA	Variables that influence fish distribution (dist. from shore, temp., salinity, etc.)	1	2	0	1	0	0	0	0	0	4
Bull, Kendall. 1994. Offshore Platforms as Artificial Reefs in the Gulf of Mexico	GOA	-The predominance of immature fish and the paucity of adults of those same species on 128-A indicated that this artificial reef was acting as a recruitment site. - Observations made in 1989 at 86-A and 128-A suggest that differences [in species composition] were related to the manner by which each structure was toppled and the length of time each had remained undisturbed.	0	2	0	1	0	0	1	0	0	4
Egerton, et al. 2021. Understanding patterns of fish backscatter, size and density around petroleum platforms of the U.S. Gulf of Mexico using hydroacoustic data	GOA	Focused on hydroacoustic survey methods - Significantly greater mean fish densities and mean volume backscatter (MVBS) occurred at Coastal sites and these variables decreased with increasing seabed depth, while mean target strength (TS) was highest at Offshore sites. Greatest values of fish MVBS and density were found at the shortest distances (0-25 m) from platforms. Generalized additive mixed models suggested that salinity and temperature had a significant effect on fish density, TS, and MVBS. The number of other platforms within 5 km also had a significant effect on MVBS.	0	2	0	1	0	0	1	0	0	4
Glenn, et al. 2017. Red snapper reproductive output	GOA	Potential negative impacts from artificial reefs on red snapper reproductive output. Annual fecundity estimates were almost 20-fold higher in fish collected from natural habitats. Due to the high number of artificial habitats in the Gulf, these results suggest that accounting for metapopulation differences in reproductive potential is important in evaluating the status of this resource.	0	2	0	0	0	0	2	0	0	4

Resource Name	State / Region	Content Notes	Back-ground (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
GSMFC. 2004. Guidelines for marine artificial reef materials, 2nd edition.	GOA	Good background info and resources in lit cited	2	2	0	0	0	0	0	0	0	4
Karnasukas, et al. 2017. Red snapper habitat in GOM	GOA	Potential impacts from artificial reefs on red snapper catch We estimated that for the youngest age classes, catch rates were approximately 20 times higher on artificial structures than on natural reefs. Despite the high catch rates observed on artificial structures, they represent only a small fraction of the total area in the northern GOA; thus, we estimated that they held less than 14% of Red Snapper abundance. Because artificial structures—particularly petroleum platforms—attract mostly the youngest individuals, their contribution was even lower in terms of total population biomass (7.8%) or spawning potential (6.4%).	1	2	0	0	0	0	1	0	0	4
Kolian, et al. 2018. Use of retired oil and gas platforms for fisheries in the Gulf of Mexico	GOA	Focused on mariculture - limited relevance	1	2	0	0	0	0	1	0	0	4
Kolian, et al. 2019. Alternate use of retired oil and gas platforms for fisheries in the Gulf of Mexico	GOA	Focused on CO_2 enhanced oil recovery - limited relevance	1	2	0	0	0	0	1	0	0	4
Nieland. 2003. Red snapper recruitment to and disappearance from oil and gas platforms in the northern Gulf of Mexico	GOA	(CSA 1982 is cited in this paper)- age distributions of the commercial and recreational harvests suggest that oil and gas platforms serve as essential habitats for younger red snapper. Conversely, platforms may make red snapper at ages 4, 5, and 6 years more vulnerable to fishing mortality as they are perhaps being harvested in proportions greater than their numbers in the population at large.	0	2	0	0	1	0	1	0	0	4
Reeves, et al. 2018. Abundance and Distribution of Reef-Associated Fishes Around Small Oil and Gas Platforms in the Northern Gulf of Mexico's Hypoxic Zone	GOA	Focused on shallow water structures, but some info on potential drivers of platform selection for fishing or diving. - Nevertheless, patterns of fish abundances were not driven by the presence or absence of hypoxia. The vertical dimension of platforms is a unique and key aspect of their ecological value, especially in the hypoxic zone, and should be considered for artificial reef management.	1	2	0	1	0	0	0	0	0	4
Ajemian, et al. 2015a. Rapid assessment of fish communities on submerged oil and gas platform reefs using remotely operated vehicles	GOA	Limits to recreational diving for structure >30m water depth (i.e., toppled structure will not get utilized by divers & is difficult to survey)	0	2	0	0	0	0	1	0	0	3
Cripps, Aabel. 2002. Environmental and socio-economic impact assessment of Ekoreef, a multiple platform rigs-to-reefs development	North Sea	Evaluated potential impacts for conversion of platforms to artificial reef (did not evaluate recreational uses). Provides a scoring mechanism for evaluation. - From an environmental and ecological (including commercial fish stocks) perspective, reef use for protection would seem a better option than use for commercial fishing, although the differences within each alternative were not large.	0	0	0	0	0	1	2	0	0	3
Kasprzak, Wilson. 1994. Use of oil and gas platforms as habitat in Louisiana's artificial reef program	GOA	Conference abstract - limited utility - One disadvantage, however, is that their large size restricts the distance to shore where these platforms can be sighted. To achieve the minimum clearance of 50 feet as required by the Coast Guard regulations, the platforms must be placed in waters in excess of 100 feet. Waters of this depth are found between 14 and 72 miles off Louisiana's gently sloping continental shelf making them almost inaccessible to many anglers.	0	2	0	1	0	0	0	0	0	3
McGinnis. 2005. Political ecology of Rigs-to-Reef programs	GOA / CA	Info on the potential political influences on rig-to-reef conversion.	0	1	0	0	0	2	0	0	0	3
Van Elden, et al. 2019. Offshore Oil and Gas Platforms as Novel Ecosystems: A Global Perspective, Offshore Oil and Gas Platforms as Novel Ecosystems: A Global Perspective	Worldwide	Good historical and background	2	1	0	0	0	0	0	0	0	3
Claisse, et_al. 2014. Biological productivity of fish associated with offshore oil and gas structures on the Pacific OCS	CA	Focused on CA - limited utility	0	0	0	0	1	0	1	0	0	2
Dannheim, et al. 2020. Benthic effects of offshore renewables: identification of knowledge gaps and urgently needed research	Worldwide	Lit review to ID knowledge gaps - not much utility here	1	0	0	0	0	0	1	0	0	2

Resource Name	State / Region	Content Notes	Back-ground (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Hastings, et al. 1976. Observations on the fish fauna associated with offshore platforms	GOA	More recent papers available with similar information.	0	2	0	0	0	0	0	0	0	2
Kruse, et al. 2015. Considerations in Evaluating Potential Socioeconomic Impacts of Offshore Platform Decommissioning in California	CA	Focused on CA - limited utility	0	0	0	0	1	0	1	0	0	2
Lindquist, et al. 2004. Distribution patterns of larval and juvenile fishes at offshore petroleum platforms in the north-central Gulf of Mexico	GOA	Larval & juvenile fish - limited relevance	0	2	0	0	0	0	0	0	0	2
Meyer-Gutbrod, et al. 2020. Forecasting the legacy of offshore oil and gas platforms on fish community structure and productivity	CA	limited relevant info: - Public sentiment on artificial reef conversion is mixed, with some groups preferring sites to be returned to a pristine state (Jørgensen 2012, Olsen 2016).	0	0	0	0	0	1	1	0	0	2
Render. 1995. The Life History of Red Snapper and Its Affinity for Oil and Gas Platforms	GOA	Redundant with more recent info	0	2	0	0	0	0	0	0	0	2
Aabel, et al. 1997	North Sea	North Sea - limited relevance to GOA	0	0	0	1	0	0	0	0	0	1
Andaloro, et al. 2011. Evaluating fish assemblages associated with gas platforms	Adriatic Sea	Focused on survey methods in Adriatic Sea - not useful	0	0	0	0	0	0	1	0	0	1
Geronimo, et al. 2018. Mapping Fishing Activities and Suitable Fishing	Philippines	Limited to no relevance	0	0	0	0	0	0	1	0	0	1
Montes, et al. 2018. Modeling the spatial and seasonal distribution of offshore recreational vessels in the southeast United States.	FL, GA	East coast FL & GA - limited utility. May inform future recreational fishery modeling efforts in GOA	0	0	0	0	0	0	0	0	1	1
Pascoe, Innes. 2018. Economic Impacts of the Development of an Offshore Oil and Gas Industry on Fishing Industries	Worldwide	Limited relevance to recreational use	0	1	0	0	0	0	0	0	0	1
Punzo, et al. 2015. Fish detection around offshore artificial structures: preliminary results from hydroacoustics and fishing surveys	North Sea	Limited relevance to recreational use	1	0	0	0	0	0	0	0	0	1
Sheehan, et al. 2019. PelagiCam: a novel underwater imaging system for semi-automated monitoring of mobile marine fauna at offshore structures	UK	Technology-focused; limited relevance to recreational use	0	0	0	0	0	0	1	0	0	1
Smith_Byrd. 2020. Potential Cost Savings From Converting CA OCS Oil And Gas Platform Jackets To Artificial Reefs	CA	Focused on CA & cost of conversion to artificial reef - limited utility	0	0	0	0	0	0	1	0	0	1
Bull and Kendall. 1994. An Indication of the Process Offshore Platforms as Artificial Reefs in the Gulf of Mexico	GOA	Report summarizing how oil platforms act as artificial reefs. This report was identified in the keyword search but has no relation to recreational uses	0	0	0	0	0	0	0	0	0	0
Helvey. 2002. Are southern California oil and gas platforms essential fish habitat	CA	Focused on CA and EFH	0	0	0	0	0	0	0	0	0	0
Salardi, et al. 2018. A New Economic And Ecological Concept For Offshore Decommissioning	N/A	Published by energy company - not relevant	0	0	0	0	0	0	0	0	0	0
Schroeder, et al. 2000	CA	Focused on CA & comparison to natural reef - limited utility	0	0	0	0	0	0	0	0	0	0
Stephan, Osburn, et al. 989	GOA	Abstract only - focused on fish density - likely more recent info available	0	0	0	0	0	0	0	0	0	0
Torquato, et al. 2017. Vertical zonation and functional diversity of fish assemblages revealed by remotely operated vehicle videos at oil platforms in The Gulf	Persian Gulf	Gulf = Persian Gulf; limited relevance to recreational use in GOA	0	0	0	0	0	0	0	0	0	0

Table A-2. Database and other publications

During the Literature Review task, each resource in the table below was rated on nine relevance criteria on a scale of zero to two or three (scale indicated in parentheses under each criterion). Criteria ratings were summed to assign each resource an overall Relevance Score (max value = 25). Resources were evaluated according to the following relevancy score scale: 0-2 = Poor; 3-7 = Fair; 8+ = Good. Additional literature that is included in this Synthesis Report is provided in Section 6.

Resource Name	State /Region	Organization/ Agency	Website	Content Notes	Background (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Office of Coastal Management	LA	State of Louisiana Department of Natural Resources	-	The Office of Coastal Management (OCM) of the Louisiana Department of Natural Resources (LADNR) is charged with implementing the Louisiana Coastal Resources Program under authority of the Louisiana State and Local Coastal Resources Management Act of 1978, as amended (Act 361, La. R.S. 49:214.21 et seq). The law seeks to encourage multiple uses of resources and adequate economic growth while minimizing adverse impacts of one resource use upon another without imposing undue restrictions on any user. In order to successfully accomplish this, a balance must be struck between conservation and resources. Coastal zone spatial data	1	1	1	1	1	2	2	3	0	12
Office of Coastal Management	LA	State of Louisiana Department of Natural Resources	http://www.dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=928	Coast Zone Boundary Maps	1	2	2	1	1	1	1	3	0	12
Coastal Habitat Restoration GIS	TX	Texas A&M Corpus Christi	http://www.cbi.tamucc.edu/CHRGIS/	The Coastal Habitat Restoration Geographic Information System (CHRGIS) is an interactive, online archive, qualitative analysis, and mapping tool. CHRGIS provides for visualization of beach profile survey data and aerial imagery from the Coastal Erosion Planning & Response Act (CEPRA) Program, in support of the Beach Monitoring and Maintenance Plan. The mapping and profile analysis tools allow for online qualitative analysis of beaches nourished through the CEPRA program and was developed by the Conrad Blucher Institute at Texas A&M University-Corpus Christi, through collaboration with the Texas Coastal Management Program (CMP) and the CEPRA program.	1	1	1	1	1	1	1	3	2	12
Coast Management Program	TX	Texas GLO, Coastal Management Program	https://www.glo.texas.gov/coast/grant-projects/cmp/index.html	The Texas CMP, funded by NOAA, focuses on the state's coastal natural resource areas. The program is managed by the Texas Land Commissioner, and awards approximately $2.2 million annually in grants. Reviews federal actions in the Texas coastal zone to ensure consistency with the goals and policies of the CMP Supports protection of natural habitats and wildlife Provides baseline data on the health of gulf waters The federally approved program brings approximately $2.2 million in federal Coastal Zone Management Act (CZMA) funds to Texas, most of which goes to state and local entities to implement projects and program activities. Texas is one of only a handful of coastal states that pass substantial amounts of CZMA funds through to coastal communities for projects in the coastal zone. The Land Office has funded projects in all parts of the coastal zone for a wide variety of purposes. The GLO established the following categories for use of these funds by coastal communities: Coastal Natural Hazards Response Critical Areas Enhancement Public Access Waterfront Revitalization and Ecotourism Development Permit Streamlining/Assistance, Governmental Coordination and Local Government Planning Assistance Water Sediment Quantity and Quality Improvements	2	2	1	1	1	1	1	3	0	12
Coast Resources Management	MS	Mississippi Department of Marine Resources	https://dmr.ms.gov/artificial-reef/	Maps showing coastal and offshore reefs are available for download.	1	1	1	1	1	1	1	3	1	11

Resource Name	State /Region	Organization/ Agency	Website	Content Notes	Background (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Coastal Resources Mapping Viewer	TX	TX GLO	https://cgis.glo.texas.gov/rmc/index.html	Resource Management Codes are assigned to state-owned tracts in Texas bays and the Gulf of Mexico, providing development guidelines for activities within each tract. The codes enhance protection of sensitive natural resources by providing recommendations for minimizing adverse impacts from mineral exploration and development activities. The codes include recommendations from the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Texas Parks and Wildlife Department, Texas Historical Commission, and the U.S. Army Corps of Engineers.	0	2	2	0	2	1	1	3	0	11
Coastal Recreation	TX	Texas GLO, Coastal Management Program	www.texascoasts.com	Webmap developed by Texas partners and Texas A&M using NOAA grant funding. https://www.harte.org/project/restoring-and-enhancing-structurally-complex-nursery-habitat-enhance-reef-fish-populations - No online access to data. - Locates beach and bay access points.	1	1	1	1	1	1	1	3	1	11
Texas One Gulf	TX	Texas One Gulf	https://www.texasonegulf.org/	Beginning in 2015, the first 5 years of operation for the RESTORE-funded Texas OneGulf Center of Excellence resulted in seven projects totaling nearly $3 million for research addressing priority problems affecting the health and wellbeing of Texas and the Gulf of Mexico. This funding was supplemented by the Office of the Governor, resulting in an additional 11 projects with about $2 million in research funding. These projects represented the first major allocation of research dollars from the Texas OneGulf consortium, which was created after the *Deepwater Horizon* oil spill to direct funding in support of programs, projects and activities that restore and protect the environment and economy of the Gulf Coast region.	1	1	1	1	1	1	1	1	2	10
Alabama Artificial Reef Program	AL	Alabama Department of Conservation and Natural Resources, Marine Resources Division, Artificial Reef Program	https://www.outdooralabama.com/saltwater-fishing/artificial-reefs	Program is not as well defined as other states. There is no central Plan, just three near-term construction development plans. No online data available for non-fishing recreation related to O/G platforms.	2	2	0	1	1	0	0	3	0	9
Louisiana Artificial Reef Program	LA	Louisiana Artificial Reef Program	https://www.wlf.louisiana.gov/page/artificial-reefs	Website has moderate information on their reefing program and maps available, but only minor mention of non-fishing rec around O/G platforms and no quantitative recreational use data is available online. The Plan mentions several primary sources on recreational diving dating from 1979-1985. The Plan compiles recreational (including diving) use patterns, and collected data from O/G platform operators that recorded observations on boats, numbers of fishermen, fish caught, etc. The Plan links O/G platforms with charter boat tourism success.	2	2	0	1	1	0	0	3	0	9
Mississippi Artificial Reef Program	MS	Mississippi Department of Marine Resources, Artificial Reef Bureau, Artificial Reef Program	https://dmr.ms.gov/artificial-reef/#:~:text=with%203D%20images-,RIGS%20TO%20REEF,enhancing%20fish%20and%20invertebrate%20habitat.	Mississippi's website offers no hard data on recreational use of O/G platforms specifically, but they do have a decent mapping program for locational data, and some really cool 3D sonar data of every reef structure including their reefed oil rigs.	2	2	0	1	1	0	0	3	0	9

Resource Name	State /Region	Organization/ Agency	Website	Content Notes	Background (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
ShivelyJ-2017 -Testimony: Texas Rigs-to-Reefs program in the Gulf of Mexico – Overview	TX	n/a	https://congress.gov/115/meeting/house/105965/witnesses/HHRG-115-II06-Wstate-ShivelyJ-20170517.pdf	Good background info & resources for recreational fisheries - depending on location, platform reefs can hold a large biomass of commercially and recreationally important fish species (GSMFC 2004). - it has been determined that anglers who fish around platforms catch more, larger, and more desirable fish than marine recreational fishermen who fish other areas of the Gulf (Witzig 1986). Researchers using data from the US National Marine Fisheries Marine Recreational Fisheries Survey have estimated that 30% of the recreational fisheries catch were caught near platforms off Louisiana and Texas (Avanti, Inc. (1991).	2	2	2	1	2	0	0	0	0	9
Texas Artificial Reef Program	TX	Texas Parks and Wildlife Department, Artificial Reef Program	https://tpwd.texas.gov/publications/pwdpubs/media/pwd_br_v3400_0123a.pdf	Lots of online info on the reefing program and maps, but descriptions of the actual uses are anecdotal and not quantitative. The Plan is high-level and discusses only the Plan objectives, but offers no supporting data.	2	2	0	1	1	0	0	3	0	9
Smithsonian	TX	Smithsonian	https://www.smithsonianmag.com/travel/gulf-mexicos-hottest-diving-spots-are-decommissioned-oil-rigs-180971728/	The Top Five Oil Rigs to Dive in the Gulf of Mexico, According to Emily Hazelwood High Island A389 - Located off of Galveston, Texas, this was the first decommissioned oil platform to be reefed in Flower Garden Banks National Marine Sanctuary—and in any marine sanctuary for that matter. High Island A376 - The warm clear waters surrounding this platform, just outside of Flower Garden Banks, are filled with interesting corals and large pelagic species, including manta rays. MP 299 - This site is close to shore, about 25 miles off of Louisiana, but due to a steep drop-off, the waters are clean, blue and unaffected by the Mississippi River outflow. Vermilion 171A - At this easily accessible platform, two hours west of New Orleans and just two to three miles from Cypremort Point State Park, divers find large schools of Atlantic spadefish and crevalle jacks. Mustang Island-828 Reef - Also relatively close to shore, at about 27 nmi from Port Aransas, Texas, this 4-pile jacket stands in approximately 165 feet of water.	1	1	1	1	1	2	2	0	0	9
Alabama's Snapper Check	AL	Alabama Department of Conservation and Natural Resources and	https://www.outdooralabama.com/2020-red-snapper-landings-summary	NOAA Certified under MRIP. Survey recording annual red snapper catch data. https://www.fisheries.noaa.gov/tags/recreational-fishing-data Good red snapper catch data but does not provide spatial data.	0	2	3	0	2	0	0	1	0	8
Spear fishing	FL	Florida Fish and Wildlife Conservation Commission	https://myfwc.com/fishing/saltwater/recreational/spearing/#:~:text=You%20may%20NOT%20spearfish%20(excluding,species%20in%20freshwater%20is%20prohibited.&text=(Possession%20of%20spearfishing%20equipment%20is,is%20unloaded%20and%20properly%20stored.)	Spearfishing is defined as "the catching or taking of a fish through the instrumentality of a hand or mechanically propelled, single or multi-pronged spear or lance, barbed or barbless, operated by a person swimming at or below the surface of the water."	1	1	1	1	1	1	1	0	1	8
Fisheries Information Network (FIN)	GOA	Gulf State Marine Fisheries Commission (GulfFIN)	https://data.gsmfc.org/apex/public/f?p=1495:1:840627180804::::&tz=-5:00	MRIP data. Compiles commercial and recreational fisheries catch estimates by species per state up to 2018. Data warehouse available with more resources possibly with membership. Good but information going through MRIP.	0	2	3	0	2	0	0	1	0	8
Flower Garden Banks National Marine Sanctuary	GOA	NMFS	https://flowergarden.noaa.gov/	Marine Sanctuary providing a diving destination and coral-reef experience unique in the eastern portion of the Gulf of Mexico, as well as snorkeling and fishing opportunities. NOAA has developed a Management Plan which is available for download.	1	1	0	1	1	0	1	3	0	8

Resource Name	State /Region	Organization/ Agency	Website	Content Notes	Background (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
LA Creel	LA	Louisiana Department of Wildlife and Fisheries	https://www.wlf.louisiana.gov/page/la-creel-data-query	Recreational, for-hire charters, commercial fishing data for Louisiana. Online access to State data not apparent. Good multiple species catch data and can separate out categories of recreational fisheries # of fish and trips by month. No spatial data.	0	2	3	0	2	0	0	1	0	8
Louisiana Red Snapper Data	LA	Louisiana Department of Wildlife and Fisheries	https://www.wlf.louisiana.gov/page/red-snapper	Louisiana recreational red snapper landing data. Good red snapper catch data but does not provide spatial data.	0	2	3	0	2	0	0	1	0	8
Office of Coastal Management	LA	State of Louisiana Department of Natural Resources	https://data.dnr.la.gov/LCP/PERMITS/OCM%20FEIS%20Final%20Environmental%20Impact%20Statement%2000-00-1980.pdf	Coastal Mgt Final Environmental Impact Statement (EIS)	1	2	3	0	0	0	0	1	1	8
Tails N' Scales	MS	Mississippi Dept. of Marine Resources	https://dmr.ms.gov/snapper/	Tails N' Scales Information has 2017–2019 Red snapper season finalize results including: total harvest, number of fish harvested, average weight, average length, number of trips, effort (angler/vessel/trip), and harvest (fish/angler/trip). Good red snapper catch data but does not provide spatial data.	0	2	3	0	2	0	0	1	0	8
Access Point Angler Intercept Survey (APAIS)	Nationwide	NOAA	https://www.fisheries.noaa.gov/recreational-fishing-data/access-point-angler-intercept-survey-glance#more-information	NOAA Fisheries program conducting surveys on recreational fishermen. Good but information going through MRIP.	0	2	3	0	2	0	0	1	0	8
Fishing Effort Survey (FES)	Nationwide	NOAA	https://www.fisheries.noaa.gov/recreational-fishing-data/fishing-effort-survey-glance	NOAA MRIP program. The FES gathers information about the number of saltwater trips anglers take in Hawaii and along the Atlantic and Gulf coasts. Good but information going through MRIP.	0	2	3	0	2	0	0	1	0	8
MRIP Database: species query	GOA	NOAA	https://www.fisheries.noaa.gov/data-tools/recreational-fisheries-statistics-queries	No spatially explicit info Could be useful paired with other info (e.g., extrapolation based on info from stakeholder interviews).	0	2	1	0	2	1	0	1	0	7
MRIP Database: vessel-type query	GOA	NOAA	https://www.fisheries.noaa.gov/data-tools/recreational-fisheries-statistics-queries	No spatially explicit info Could be used to evaluate % of trips nearshore vs. offshore.	0	2	1	0	2	1	0	1	0	7
Center for Sportsfish Science and Conservation (CSSC)	GOA	Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi,	https://www.sportfishcenter.org/	The CSSC is the first research center in the western Gulf of Mexico dedicated to providing key science-based information that supports sustainable management of the multibillion-dollar recreational fishery that flourishes along the Gulf Coast. 2015 Results (included in Literature results) contained useful recreational fishing trip data. Requested additional year data.	2	1	1	2	1	0	0	0	0	7
EcoRigs	GOA	ecorigs.org	www.ecorigs.org	EcoRigs is a non-profit 501 (c) corporation. Its mission is to save retired platforms from removal to be redeployed for use in sustainable fisheries, recreational fisheries, fish sanctuaries, renewable energy, sequestration of greenhouse gases, and other beneficial environmental applications. Retired platforms can be used for the sequestration of greenhouse gases and the production of renewable ocean energy derived from wind, current, wave, geo-thermal, salinity gradients, and bio-fuels and the production of hydrogen, (i.e. extraction of hydrogen from seawater via electrolysis). Some publications on benefits of platforms and justifications and legal reasons for not removing them but mostly pre-2012.	1	2	0	0	2	1	0	1	0	7

Resource Name	State /Region	Organization/ Agency	Website	Content Notes	Background (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
GIS data (artificial reefs); recreational fishing?	TX	Texas Parks and Wildlife	https://tpwd.texas.gov/fishboat/fish/management/ https://tpwd.texas.gov/landwater/water/habitats/artificial_reef/	There are artificial reef coordinates; TPWD has been collecting intercept data from recreational fishermen for years. Getting the data will require an email request. 1/18/21 submitted Open Records request reference: R0000095-011821. (https://tpwd.texas.gov/site/openrecords). 1/28/21 status request sent. Received response from information requested with applicable literature. Additional requests needed.	0	2	1	0	2	1	0	1	0	7
Sportfishing center	TX	Sportfishing center Texas A&M University, Harte Institute	https://www.sportfishcenter.org/outreach/isnapper-app https://www.sportfishcenter.org/publications	There is a report from a trial with an iPhone app for gathering rec fishing information. Report shows mapped locations used by recreational snapper fishermen during trial period could be one of the few mappable data sets--if we can obtain them. Information requested and informed research is on-going and currently not available for public release. 2015 Results (included in Literature results) contained useful recreational fishing trip data. Requested additional year data.	0	2	1	1	2	1	0	0	0	7
Guidelines for Marine and Artificial Reef Materials	GOA	Gulf States Marine Fisheries Commission	https://www.gsmfc.org/pubs/SFRP/Guidelines_for_Marine_Artificial_Reef_Materials_January_2004.pdf	Strong secondary resource that points to primary sources related to diving and artificial reefs. The O/G platform section of the document does not mention non-fishing recreation, but the document sections describing other artificial reef structures do discuss recreational diving. The References section could be used to determine other relevant primary sources.	2	2	0	1	1	0	0	0	0	6
Central OCS Planning Area NEPA Analysis	Gulf States	BOEM. Central OCS Planning Area Lease Sale EIS 2015-2017	https://www.boem.gov/sites/default/files/boem-newsroom/Library/Publications/2014/BOEM-2014-010.pdf https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Assessment/NEPA/BOEM-2012-019_v1.pdf	EIS analysis for OCS lease program	1	1	0	1	1	0	0	0	0	4
Alternative Energy EIS 2007	Gulf States and California	BOEM	https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/Alt_Energy_FPEIS_Chapter6.pdf	Alternative Energy EIS. Offers a secondary and cursory discussion from primary sources that support recreational uses such as diving, SCUBA diving, and fishing.	1	1	0	1	1	0	0	0	0	4
Website	TX	Spearoscout	https://spearoscout.com/texas-spearfishing-the-best-places-to-spearfish-in-texas-and-types-of-fish/	Offers the authors best places to spearfish in Texas, and describes the benefits of this activity, as well as snorkeling and diving specifically around oil rigs.	1	1	0	1	1	0	0	0	0	4
Vertical Reefs	Worldwide	Vertical Reefs: Life on Oil and Gas Platforms in the Gulf of Mexico (Volume 27) (Gulf Coast Books, sponsored by Texas A&M University-Corpus Christi)	n/a	Thousands of petroleum platforms in the Gulf of Mexico and around the world act as artificial reefs, teeming with marine life. Their value in providing much needed hard substrate for the attachment of marine organisms and fishing and diving opportunities for the public cannot be overstated. This book provides an overview of the development and management of oil and gas production in the Gulf of Mexico, while showcasing the biological significance of petroleum platforms as marine habitat. It is a blend of science, natural history, and insights on vertical, man-made, man-managed reef development.	1	1	0	1	1	0	0	0	0	4
Diving	Gulf	Bryan D Enos. 2020. Texas Gulf Rig Divers: Captain Bones and the Mafatu Spearmen	n/a	A book of personal accounts of a group of recreational rig divers in the Gulf of Mexico.	0	1	0	1	1	0	0	0	0	3

Resource Name	State /Region	Organization/ Agency	Website	Content Notes	Background (0-2)	Geographic Applicability (0-2)	Scale (0-3)	Determinants (0-3)	Uses (0-3)	Trends (0-3)	Future Impacts (0-3)	Geospatial (0-3)	Other (0-3)	Relevance Score
Website	TX	American Diving - South Padre Island	https://divesouthpadre.com/dives/	Example: an outfit advertising Rig Dives	0	1	0	1	1	0	0	0	0	3
Diving	TX	Texas Scuba Adventures Galveston TX LLC	https://texasscubaadventures.com/	Example: an outfit advertising Rig Dives	0	1	0	1	1	0	0	0	0	3
Diving	TX	Ultra Dive, Texas	https://www.ultradivetexas.com/	Advertises oil rig dive sites, and rig-to-reef dive sites.	0	1	0	1	1	0	0	0	0	3
Alternative uses for offshore platforms	Worldwide	Nassar, W. M., Anaya-Lara, O., Ahmed, K.H., Campos-Gaona, D., & Elgenedy, M. (2020). Assessment of multi-use offshore platforms: structure classification and design challenges. Sustainability, 12(5), 1860.	n/a	This paper presents the state of the art of multiple use platform structures under EU-funded programs. These structures would have a positive impact on various marine activities such as tourism, aquaculture, transport, oil and gas and leisure.	1	0	0	1	1	0	0	0	0	3
Public access to Gulf of Mexico	LA	Louisiana State Parks Department, Grand Isle State Park	https://www.lastateparks.com/parks-preserves/grand-isle-state-park	A beach ridge created by the action of the waves of the Gulf, Grand Isle serves as a breakwater between the Gulf and the network of inland channels that connect to the bayou tributaries of the Mississippi River. It is also the launching point for excellent deep-sea saltwater fishing adventures.	0	1	0	0	1	0	0	0	0	2
Ocean Star Rig Museum and Oilfield Energy Center	TX		https://www.oceanstaroec.com/	The objectives of their mission are being met through a three-fold plan developed by the Center. First, the Ocean Star Offshore Drilling Rig Museum and Education Center was established in Galveston, Texas. Second, the Offshore Pioneers Hall of Fame was established to recognize and record the individual and technological achievements of the offshore energy industry. Third, Education Outreach Programs have been developed for students, teachers and the general public.	1	1	0	0	0	0	0	0	0	2
Artificial Reefs	TX	Texas A & M Corpus Christi's Harte Institute	https://www.harte.org/project/restoring-and-enhancing-structurally-complex-nursery-habitat-enhance-reef-fish-populations	Provide baseline biological information on the fishery benefits of creating and enhancing low-relief nursery habitat on the inner continental shelf in the NW Gulf of Mexico.	1	0	0	1	0	0	0	0	0	2
Coast Resources Management	AL	Alabama Coastal Management Program	https://www.outdooralabama.com/coastal-programs/alabama-coastal-area-management-program	Alabama Coastal Management Program (ACAMP) was approved by NOAA in 1979 as part of the National Coastal Zone Management Program. The Alabama Department of Conservation and Natural Resources, State Lands Division, Coastal Section is responsible for overall management of ACAMP.	0	0	0	0	1	0	0	0	0	1
Rigs-to-Reef National Program	GOA	BSEE Environmental Programs	https://www.bsee.gov/what-we-do/environmental-focuses/environmental-programs/rigs-to-reefs https://www.bsee.gov/sites/bsee.gov/files/bsee-interim-document/fact-sheet/rigs-to-reefs-ipd.pdf	Background on legislation of Rigs-to-Reefs program and implementation.	0	0	0	0	1	0	0	0	0	1
Rockefeller State Wildlife Refuge and Game Preserve	LA	State of Louisiana Department of Natural Resources	https://www.rwrefuge.com/	Primarily onshore and coastal recreation, not offshore or OCS.	0	0	0	0	1	0	0	0	0	1

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Russell Sage Foundation-Marsh Island State Wildlife Refuge	LA	State of Louisiana Department of Natural Resources	http://www.stateparks.com/russell_sage_foundation-marsh_island_state_wildlife_refuge_in_louisiana.html	Onshore and inshore recreation.	0	0	0	0	1	0	0	0	0	1
Atchafalaya NWF	LA	USFWS	https://www.fws.gov/refuge/Atchafalaya/map.html https://www.wlf.louisiana.gov/assets/Conservation/WMAs_Refuges_Conservation_Areas/Files/Atchafalaya_Delta.pdf	Onshore and inshore recreation.	0	0	0	0	1	0	0	0	0	1
Coast Resources Management	MS	Mississippi Department of Marine Resources (MDMR)	https://dmr.ms.gov/coastal-resources-management-2/#:~:text=The%20Office%20of%20Coastal%20Resources,1972%20and%20approved%20by%20NOAA.	Enhance, protect and conserve the state's marine interests. MDMR manages all marine life, public trust wetlands, adjacent uplands and waterfront areas to provide optimal commercial, recreational, educational and economical uses of these resources that are consistent with environmental concerns and social changes.	0	0	0	0	1	0	0	0	0	1
Land Management	TX	Texas Point NWR	https://www.fws.gov/refuges/profiles/recEdMore.cfm?ID=21526	Wildlife area	0	0	0	0	1	0	0	0	0	1
Land Management	TX	McFadden NWR	https://www.fws.gov/refuge/mcfaddin/	Onshore and inshore recreation	0	0	0	0	1		0	0	0	1
Land Management	TX	Aransas NWR	https://www.fws.gov/refuge/Aransas/map.html#	Onshore and inshore recreation	0	0	0	0	1	0	0	0	0	1
Edwin King Atwood Park	TX	State Park	https://www.cameroncounty.us/parks-coastal-parks/parks-edwin-king-atwood/	Onshore and inshore recreation	0	0	0	0	1	0	0	0	0	1
NPS National Seashore	TX	NPS	https://www.nps.gov/pais/planyourvisit/maps.htm	Coastal recreation	0	0	0	0	1	0	0	0	0	1
Public access to Gulf of Mexico	TX	Texas Department of Wildlife	https://tpwd.texas.gov/huntwild/hunt/wma/find_a_wma/list/?id=48	Matagorda Island is jointly owned by the Texas GLO and the U.S. Fish and Wildlife Service and is cooperatively managed as the Matagorda Island National Wildlife Refuge and State Natural Area. Texas Parks and Wildlife manages the Area for public use and the Fish and Wildlife Service has the main responsibility for managing the wildlife and habitat on the island. There is a public boat dock on the Island that offers public access to Gulf of Mexico waters.	0	1	0	0	0	0	0	0	0	1
Social media content	CA	National Geographic	https://www.youtube.com/watch?v=MWMgcbU6T2s	Visual tour of a diving at an abandoned oil rig, and shows example of what type of marine life use these artificial habitats.	0	0	0	0	0	0	0	0	0	0
Coast Management Program	GOA	BOEM	https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Assessment/CZMA/CZM-Program-Policies-for-GOM-States.pdf	Coastal zone management program policies for the Gulf of Mexico states Applicable to OCS plan filings.	0	0	0	0	0	0	0	0	0	0
Coast Guard Sectors	Gulf States	US Coast Guard	https://www.atlanticarea.uscg.mil/Our-Organization/District-8/District-Units/	Regulatory information on US Coast Guard Corpus Christi Sector, Galveston-Houston Sector, New Orleans Sector, and Mobile Sector.	0	0	0	0	0	0	0	0	0	0
Fish and Wildlife	LA	Delta National Wildlife Refuge	https://www.fws.gov/refuge/delta/	Accessible only by boat, Delta National Wildlife Refuge is a place where the wealth of the great river and the warmth of the Gulf of Mexico meet to create lush marshes that are habitat for diverse wildlife species. Large numbers of wading birds nest on the refuge, and thousands of shorebirds can be found on tidal mudflats and deltaic splays. Tens of thousands of waterfowl winter at the Refuge, and spring and fall migration bring many other bird species.	0	0	0	0	0	0	0	0	0	0

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Social media content	n/a	n/a	https://youtu.be/_5U6ENzi83w	Example: Drone flight of abandoned oil rig	0	0	0	0	0	0	0	0	0	0
Land Management	TX	Nueces County Parks and Rec	https://www.nuecesco.com/county-services/parks-coastal	Onshore and inshore recreation	0	0	0	0		0	0	0	0	0
Public access to Gulf of Mexico	TX	Texas Department of Wildlife	https://tpwd.texas.gov/huntwild/wildlife/wildlife-trails/ltc/boca-chica-loop	Boca Chica beach – southernmost TX beach. Provides public recreation access to the beach but not direct boat launch to Gulf of Mexico.	0	0	0	0	0	0	0	0	0	0

Department of the Interior (DOI)
The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

Bureau of Ocean Energy Management (BOEM)
The mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.

BOEM Environmental Studies Program
The mission of the Environmental Studies Program is to provide the information needed to predict, assess, and manage impacts from offshore energy and marine mineral exploration, development, and production activities on human, marine, and coastal environments. The proposal, selection, research, review, collaboration, production, and dissemination of each of BOEM's Environmental Studies follows the DOI Code of Scientific and Scholarly Conduct, in support of a culture of scientific and professional integrity, as set out in the DOI Departmental Manual (305 DM 3).